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Ahmedabad Textile Industries' Research Association

Applications are invited from suitable candidates for the following posts. Closing date for applications, which must be addressed to the Secretary, Ahmedabad Textile Industries' Research Association, P.O. Box 7, Ahmedabad, is October 15, 1948. Selected candidates will receive Dearness Allowance according to prevailing rules and will be eligible to benefits of Provident Fund. Higher starting salary may be given to candidates with special qualifications and for posts 1, 3 and 4, special terms may be offered.

1. **Director of the Association.** Pay: Rs. 2,000-100-2,500. *Qualifications:* Exceptional academic qualifications with a minimum ten years' experience as leader of research team actively engaged on problems connected with one or more of the following: structure and properties of natural and artificial fibres; synthesis of artificial fibres; processing and manufacture of textiles; dyeing and finishing of textiles; properties of fabrics. Outstanding personal record of research essential.

2. **Secretary of the Association.** Pay: Rs. 1,000-50-1,750. *Qualifications essential:* Minimum seven years' experience in Managerial capacity in a textile factory; thorough knowledge of the economics, the machinery and problems of all processes in textile manufacture. Desirable: appropriate high academic qualifications.

3. **Deputy Director and Head of the Department of Applied Physics.** Pay: Rs. 1,000-50-1,750. *Qualifications:* Specialist in mathematical statistics with high academic qualifications; distinguished research experience in the application of statistics to the control and study of industrial processes.

4. **Psychologist.** Pay: Rs. 600-25-800-E.B.-40-1,000. *Qualifications:* Doctor's or Master's degree of Indian or foreign University in experimental and industrial psychology, with a distinguished personal record of research.

5. **Librarian.** Pay: Rs. 250-20-350-E.B.-25-500. *Qualifications:* High academic qualifications in science; recognized diploma in librarianship; good working knowledge of French and German.

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THE SCIENTIFIC AND ECONOMIC ASPECTS OF PROHIBITION

AMONG the many ameliorative measures promulgated by the Congress Ministry when it took charge of the destinies of the Nation in the various Provinces, Prohibition remains one of the most courageous, farsighted and praiseworthy legislations. The measure is one which was dearest to Gandhiji and is calculated to remove one of the most potent causes for the poverty and unhappiness of the less fortunate classes of the population in the industrial and rural areas.

The introduction of Prohibition, while it raises the moral stature and promotes the material well-being of the common man, has led to a substantial, if not a serious, reduction in the revenues of the State, running to many tens of crores of rupees. During the last Congress Ministry Sri. C. Rajagopalachariar (now His Excellency the Governor-General of India), then Prime Minister, Madras, sought to meet the difficult financial deficit by the introduction of the Sales Tax, which proved successful in meeting the deficit to a considerable extent.

Since the 15th August 1947, enlightened opinion in the country has been growing that the effects of drink on the impoverished masses is too serious to admit of any futher delay in forging ahead with the remedial measures which include Prohibition. Prohibition as a programme of National rehabilitation and reconstruction has, therefore, been accepted as a measure demanding immediate attention. It has the enthusiastic backing of all our elder statesmen.

Prohibition has, however, raised issues which, we are afraid, have not been fully appreciated and satisfactorily tackled. In the present context of social, educational and industrial regeneration of the country for which ambitious plans have been formulated, the serious financial deficit which confronts Provincial Governments will be admitted as exceedingly unfortunate and embarrassing. In view of the present low-earning capacity of the average Indian citizen, there are very definite limits as to what can be got out of him by way of fresh taxation.

The tapping, the transport and the distribution of the toddy liquor together constitute a prosperous enterprise which

provides employment to a large number of tappers—a class of hereditary professionals who are skilled in the technique of obtaining the juice from the palms – not to speak of the personnel employed in the transport and distribution of toddy, which is carried on by a chain of middlemen, petty contractors and shop-keepers. The interests of this well developed and closely knit organisation is now at stake. The men connected with this trade amount to several hundreds of thousands and are now threatened with the prospect of losing perhaps their only means of livelihood by the introduction of this measure.

It seems to us that the stage has been more or less set for men of Science and Technology to accomplish two things: first to keep the traditional organisation functioning and prevent a crash in its structure, and (2) to discover a process by which palm juice could be converted into a valuable revenue-yielding product.

The deleterious effects of toddy (fermented juice of palm) and the arrack (the distilled liquor), which are the forms most commonly indulged in by the poorer classes of addicts, are due to their alcoholic content. The unfermented juice of the palm generally known as sweet toddy, has been recognised from times immemorial to constitute an invigorating tonic beverage prescribed by practitioners of indigenous medicine for anæmic and syphlitic patients during convalescence. Palm juice is used for making a crude form of *gur* (crude sugar) by boiling down the juice in open pans; the dark residue cast into cubes, is commercially available in restricted amounts and is employed by Ayurvedic and Unani physicians as a sweetening vehicle for many of their tonics. It enjoys the reputation of being therapeautically far superior to the *gur* made from cane juice. Considerable quantities of palm *gur* was being used as raw material in refineries for the manufacture of sugar and with the advent of Prohibition larger quantities of this product are likely to be made available since many of the Provincial Governments have already inaugurated a scheme for the manufacture of *gur* from palm juice as one of the practical solutions to the problem of its economic utilisation. There is little information regarding the costs of manufacture, whether the returns compare favourably with those of the cane *gur*.

The ideal to be aspired in the solution of this problem is to convert palm juice into a beneficent product as valuable as fermented toddy or distilled arrack has been from the point of view of the yield of revenue to the State but without the evil effects of the intoxicant on the social life of the people. If the juice could be utilised for manufacturing a product like a vitamin-rich and nourishing concentrate like malt extract or an antibiotic like penicillin, it would constitute a valuable achievement. Since the juice is known to contain on an average, 10-12 per cent. of cane sugar, the product should provide an ideal raw material for many of the fermentation industries, including those pertaining to the production of citric and lactic acids. Whatever be the product proposed to be manufactured, we are initially confronted with two major limitations: the first difficulty arises out of the inherent quality of the juice, *viz.*, the extreme rapidity with which it gets infected and ferments, the second one is connected with the circumstance that the palm trees do not occur as continuous and uniformly distributed plantations but appear as fortuitously scattered groups in widely separated and sometimes difficultly accessible areas. This situation renders the tapping, collection and transport of the juice difficult, time consuming and expensive.

The problem of collecting the material from widely scattered areas and preserving it from spoilage until it reaches a central factory where it is to be further processed, demands the immediate attention of those interested in a rational solution of the problem. The Government of Bombay have recently instituted the award of a prize of Rs. 10,000 for the discovery of a preservative which would effectively keep the juice in its natural state without any "spoilage" and without lowering or abolishing any of its "goodness".

We understand that this problem is being vigorously tackled both at the Indian Agricultural Research Institute, New Delhi, and at the Indian Institute of Science, Bangalore. Investigations at Bangalore have revealed that freshly drawn and carefully preserved juice contains adequate amounts of the more important components of the B-complex and is nutritively and therapeautically comparable to malt extract. These preli-

minary findings lend convincing support to the time-honoured belief in the efficacy of palm juice as a health giving tonic. It is to be expected that the researches now under way may lead to an entirely new approach to the problem of the economic utilisation of the juice.

There is one aspect of this problem which merits elucidation in some detail. Palm juice as a raw material for the manufacture of cane sugar offers many exceptional advantages. First, the expensive crushing machinery which is an essential part of every cane sugar manufacturing enterprise, can be eliminated in the case of a factory devoted to the manufacture of sugar from palms. Palm juice is the result of just "tapping" which of course is a highly skilled operation. Secondly, since the juice is comparatively free from chlorophyllous and other pigments, the process of clarification is considerably simplified. Thirdly, the juice is considered to be free from sucrose inverting enzymes, which minimise the formation of molasses. Fourthly, the annual cost of cultivation attending the raising of sugarcane crops is entirely eliminated. To-day, palms constitute a free and generous gift of Nature; they flourish without any attention in some of the most inhospitable and barren soils and continue to yield the saccharine juice for 60-70 years. With a little attention and care the useful life of the palm could perhaps be extended and the yield of juice augmented. These are problems for the future when the palm will come to be recognised as the sugar yielding perennial yielding sugar.

It is interesting to recall that as early as 1901, a company (The Khandwa Sugar Manufacturing Co.) was organised in the Central Provinces to promote the production of palm sugar. The causes which led to the failure of the enterprise are obscure and it would be interesting and instructive to investigate them. Exact data are not available on the question of the yield of the juice per tree per season. It is roughly estimated that a single palm, if well developed, might yield sufficient juice to make a maund of sugar which, at the current rate, would cost about Rs. 35. If a hundred palms can be optimally stocked in an acre of land, the annual gross revenue per acre would amount to a surprising figure of Rs. 3,500. These data have to be checked but they serve to emphasise the potentially remunerative aspects of the enterprise. A conservative estimate of the number of palms in the country puts the figure at 4 crores; this potential source of natural wealth sould be exploited. We would strongly urge the Provincial and State Governments interested in this perennial crop, to constitute a Central Advisory Board to devise ways and means by which this important source of raw material could be economically capitalised in support of Prohibition and the services of the present trade organisation mobilised on modern lines without creating unemployment in its ranks.

DUTY OF SCIENTISTS TO THE STATE

ADDRESSING the members of the Gymkhana of the Indian Institute of Science, during his visit to the Institute on 21st August 1948 His Excellency Sri. Rajagopalachari referred to the immensity and the urgency of the problems of rehabilitation and reconstruction confronting Independent India. He said, "Without the help of science, our leaders will not be able to do much for the country. That is why the Prime Minister continually and, if I may say so, wistfully looks up to the help of science so that we could be enabled to do something for the people in spite of all our difficulties. I want you to realise your responsibilities. You are not simply here studying for a career. That might have been so before. Now you are studying in order to help the Government."

Proceeding, His Excellency declared, "I do not think that anywhere in India they have an Institute of this character and, if I may say so, of this size also. It has grown very big, it has grown very important. You have in your hands all science so to say and it is for you therefore to realise this fact that the leaders in the Government of India are looking up to you. You must therefore study things with that realisation of your importance. If you do that, I am sure that in the course of the next 12 years the work of the Government will have been made much easier than it is now and they can get men to help them in all directions."

Concluding, His Excellency said, "Do not ask, what will be my salary and allowance. Your salary is service to the country, your allowance will be the smiles of the Government when you do well. If you realise this and find joy in it, I am sure that everything will be satisfactory. When you make an experiment in the laboratory, when you find the results successful and you are able to put them down on paper, you feel joyed apart from what you can get in rupees, annas and pies. Your studies as a whole are like experiments in the laboratory devoted for the service of the country and it must be a joy to you, indeed, if you have succeeded in your experisments."

DIAMONDS IN INDUSTRY

"DIAMOND Tools" was the subject of an interesting lecture by Sir C. V. Raman, Kt., F.R.S., N.L., in the Chemical Engineering Society of the Indian Institute of Science, Bangalore, on the 18th September 1948. Sir C. V. Raman referred at first to the numerous theoretical and experimental investigations on the subject of diamond, by himself and his collaborators, extending over a period of nearly 20 years and actuated only by the desire for fundamental knowledge. He remarked that his recent tour of the United Kingdom and the U.S.A. tended to confirm the views he had always had that an intensive study of the structure and properties of diamond would prove of the utmost importance not only for the pure branches of Science but for industry and technology as well; for, he said, industry especially in the U.S.A., has found uses already for diamond almost in its every department. He explained how for example diamond dust is utilised in the spectacle-making industry for cutting, grinding and polishing at a surprisingly fast rate; also, he described the use of diamond in the making of special high grade precision tools needed for shaping, in the manufacture of billiard balls, printing rollers, the burnishing of steel watches and so forth. He added that specimens of the crystal were utilised as dies, for drawing wires as thin as 10 μ after drilling through them an optically perfect hole of the required size and special shape with the aid of microscopes. He emphasised the fact that industry in U.S.A. has reached a stage when high class precision work demanded the use of diamond almost everywhere and moreover, found it worth while to employ high class material for the purpose.

He said that increasing demand for the utilisation of diamonds in industry did not in any way come to him as a surprise because, he said, mechanical properties of diamond, including especially its great hardness and compressive strength, warrant its extensive use in technology. Incidentally, he referred also to the vectorial variations in hardness which have come to light in the process of polishing the cubical, dodechahedral and octahedral faces of diamond and suggested an explanation of these variations in terms of its crystal structure.

PROF. BLACKETT AT BANGALORE

IN an interesting lecture on the Magnetism of Rotating Bodies delivered before the Physics Section of the Indian Institute of Science on the 24th August 1948, Prof. P. M. S. Blackett, F.R.S., the distinguished British scientist now on a visit to India, reviewed the latest position of the general theory proposed by him last year in regard to the magnetic field of massive rotating bodies.*

Introducing the subject, Prof. Blackett stated how for a long time it has been known, especially from the work of Schuster, Sutherland and H. A. Wilson, that the magnetic moment P and the angular momentum U of the earth and the sun are nearly proportional and that the constant of proportionality is nearly the square root of the gravitational constant G, divided by the velocity of light c. He said that when, for the first time, the magnetic field of a star, *78 virginis*, was measured by Babcock, the calculated value of its magnetic field agreed with its observed value, leading to a verification of the above relationship for the three bodies and covering a range of P and U of more than 10^{10} : 1, though only 2,000 : 1 in measured field. It was therefore considered that the above relationship pointed to some new and fundamental property of rotating matter.

Proceeding, the distinguished lecturer surveyed the various specific theories of earth's magnetism and remarked how recent investigations of Bullard and others favoured only the core theory. Their measurements of the earth's magnetic field down a mine 4,000 feet deep revealed an increase, though slight, in agreement with the core theory. But the magnitude of the increase was considered too small (though greater than marginal errors) to warrant any major conclusions. In this connection Prof. Blackett suggested that the problem of the earth's magnetism was of perennial interest and that it was "quite a serious proposition" for some one in India to carry out similar measurements in the Kolar Gold Fields, which he said, was the world's deepest mine, being nearly 9,000 feet deep.

In the course of his lecture, Prof. Blackett dealt also with the various factors such as the variability of the sun's magnetic field and others, that seemed to throw into doubt the fundamental nature of the relationship instituted by him between magnetic moment and angular momentum of rotating bodies.

*Vide *Nature*, 1947, **159**, 659.

MANGANESE TOXICITY AS A PROBABLE CAUSE OF THE *BAND* DISEASE OF ARECA PALM

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THE areca palms in the Ratnagiri and Kolaba districts of Bombay Province have been known for a long time to suffer from a disease locally known as *band*. The disease is characterised by the shortening and thickening of the leaves and leaflets which acquire a dark green colour and a leathery feel. The internodes become short as the palm advances in age and the stem gets constricted at the top. The palm stops bearing, the crown gets smaller and smaller and it ultimately dries up and falls off. The problem was investigated on several occasions during the last 50 years as a result of which it was found that no fungus or insect was responsible for causing the disease and that it was probably due to nutritional disorder brought about by poor soil fertility. In this note is presented an account of preliminary investigations carried out in 1944 on the soils of some of these gardens.

The soil consists of a sandy coastal alluvium derived from trap and laterite, and contains considerable quantities of magnetic oxide of iron which, at some places, was found to be present in the form of regular bands about 4 to 6 inches in thickness. The morphological examination of the profiles revealed the presence of free water in the lower layers. There was a complete absence of carbonates upto a depth of about three feet. At this depth a hard compact layer of sand mixed with lime was found to be present which seemed to act as a barrier to the free percolation of water.

The examination of soil samples collected from the vicinity of diseased and healthy trees in the gardens selected for this study showed that they were well supplied with nitrogen, phosphoric acid and potash. The soils near the diseased tree showed less available phosphoric acid and potash than those near healthy trees. They were on the whole poor in lime ($CaCO_3$) and in many layers it was absent altogether. They did not show any excessive accumulation of soluble salts. The ammonifying and nitrifying powers as well as the respiratory activity of the soils were found to be considerably impaired, more so near the diseased tree. The soil reaction varied from neutral to slightly alkaline.

While determining the pH value by the quinhydrone method some of the samples showed a considerable drift in the potential. The presence of manganese oxides was, therefore, suspected. The soils were, therefore, analysed for total, water soluble, exchangeable and easily reducible manganese.[1] Samples collected at two other localities, one at Sirsi and the other at Kirkee where this disease is absent, were also analysed for the various forms of manganese. The results (Table I) show that the soils from the affected area contain much more manganese, total as well as available, than those of the other two places. They are also very high in exchangeable and reducible manganese. The more striking feature is the presence of large quantities of available manganese in soil near diseased tree as compared to that near the healthy tree. The whole of the manganese in the surface layer near the diseased tree is present in an available form. The presence of such large quantities of available manganese seems to be due to the prevalence of reducing conditions in the profile brought about by partial waterlogging to which these soils are prone, and to the absence of free calcium carbonate in the soil.

TABLE I

Total and available manganese in soil
(Mgm. Mn per 100 gm. of air-dry soil)

Description	Layer	Total	Water soluble	Exchangeable	Reducible	Total available
Profile No. I at Murdi in a diseased garden; near a healthy tree	0–4″	211·9	nil	98·2	16·0	114·2
	4″–18″	229·5	,,	32·9	101·2	134·1
Profile No. III at Murdi in a diseased garden; near a diseased tree	0–9″	203·9	,,	125·9	78·8	204·7
	9″–19″	223·9	,,	41·9	114·0	155·9
	19″–31″	232·5	,,	39·5	87·2	126·7
	31″–40″	204·7	,,	31·5	86·6	118·1
Soil near a healthy tree in Ganeshkhind Fruit Experimental Station, Kirkee	0–9″	107·3	,,	43·5	18·3	61·8
	9″–18″	113·7	,,	36·9	26·4	63·3
Soil near a healthy tree at Sirsi, N. Kanara	0″–6″	91·5	not determined	39·0	40·5	79·5
	6″–12″	55·5	,,	26·5	20·9	47·4
	12″–18″	75·6	,,	23·7	31·0	54·7
	18″–24″	98·1	,,	25·2	53·6	78·8
	24″–33″	69·6	,,	29·1	30·5	59·6

TABLE II

Manganese and iron content of the leaves of areca palm
(Mgm. per 100 gm. dry matter)

Description		Manganese (Mn)	Iron (Fe)
Diseased garden at Murdi village	Healthy tree	3·22	44·41
	Tree just affected	7·94	50·75
	Diseased tree	10·42	125·30
Diseased garden at Anjarla village	Healthy tree	8·11	64·71
	Diseased tree	17·88	222·60
Healthy gardens	Healthy tree at Kirkee	0·55	..
	Healthy tree at Sirsi	3·67	..

In order to see how the high availability of manganese in the soil affects its uptake by the plant, samples of the first leaf of the areca palm collected at all the three localities were

analysed for their total manganese contents. In addition to manganese they were also analysed for their iron contents. The results of this analysis given in Table II show that the leaves of the areca palm in diseased gardens contain much more manganese and iron than those in healthy gardens at both Kirkee and Sirsi where this disease is absen . Similarly even in diseased gardens the leaves of the tree affected with *band* contain much more manganese and iron than those of healthy trees. The high manganese and iron contents of the leaves in diseased gardens seem to be brought about by the high availability of these two constituents in the soils of this tract. The abnormally high absorption of these elements is likely to prove toxic and the toxicity so produced seems to be the cause of the disease.

It is intended to carry on further work to confirm these views when the work under a scheme of investigation submitted to the Indian Central Coconut Committee is started.

The author is indebted to Mr. M. M. Kibe for carrying out the analysis.

1. Piper, C. S., "The availability of manganese in the soil.," *J. Agric. Sci.*, **1931, 21, 762.**

THE OCCURRENCE AND UTILIZATION OF LIGNITES

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(Andhra University, Waltair)

Occurrence

LIGNITE is immature coal or partially carbonised fossil wood, brown or black in colour, amorphous or having a conchoidal or cubical fracture and generally retaining its woody fibre. It is intermediate in its qualities between peat and coal. It occurs in large deposits in various parts of the world, chiefly in Australia, Canada and Central Europe. In India, its occurrence is reported from several localities mostly from tertiary deposits[1]; the Kashmir Valley formation,[2] in Pondicherry,[3] in Palana (Bikaner), Jurassic strata of Cutch and in Mianwali Dist. (Kalabagh) in N.W.F.P., in Ganges delta. In South India lignites in Malabar and Travancore[4] are of importance; the areas mentioned therein are Warkalai in Travancore, Beypore in S. Malabar and between Palghat and Calicut.

During the course of investigation in N. Malabar, beds of lignite were found at several places in Cannanore, an account of which does not appear to have published till now. The lignite in this place is seen at the cliff faces overlooking the sea and is overlain by hard laterite the latter having a thickness of about twenty feet. The base of laterite above the lignite beds is clearly marked by a hard pan about an inch thick. The lignite occurs as two beds separated by bluish clay and partly intermixed with it. The upper bed is about a foot thick and the lower about five feet in thickness. Numerous lumps and 'twigs' of marcasite are found in these beds probably formed as pseudomorphs after the woody matter. The outcrop is traceable along the coast for a distance of about half a mile and inland wells penetrating beneath the laterite shows the lignite and blue clay and finally the archæan gneiss. The lignite is brown in colour and has a strong smell of sulphur. Here and there, lumps of fossil gum are found. The woody structure is visible on breaking the lignite.

Per cent.	Present sample	Place cliff	Chilakur cliff (i)	Chilakur cliff (ii)	Vettur cliff
Moisture ..	18·84	13·5	16·49	11·18	11·51
Vol. mat. ..	35·5	28·35	38·24	23·57	21·28
Fix. carbon	34·3	21·4	40·83	10·75	6·77
Ash ..	11·36	36·7	4·43	54·5	60·4
Sulphur ..	2·88	..	..	..	..
Water sol.	5·2	..	..	..	..
Lignin ..	6·1	..	..	..	..

Analysis

The analysis of the sample is given in the above table along with those of others from different sources.

On extraction with chloroform under slight pressure the present sample of lignite yielded about 2% of yellow, brittle, non-stuky wase which had the following characteristics:

Solvent	% Wase.	M.P. °C.	Sap. V.	Iod. V.	Ref.
Benzine ..	..	78·9	60–105	10–20	(5)
Chloroform	2	81·85	120·0	69·9.	Present sample

Utilization

The value of lignite as a fuel is low. Various methods, such as briquetting, low temperature carbonization, gasification to produce water gas and producer gas and hydrogenation under high pressures and temperatures to convert to hydrocarbons have been suggested and worked to improve its fuel value. Technical methods of preparing charcoal from it have been recorded.

A preliminary experiment carried out to produce active charcoal from the present sample is reported here. After extraction of the wax, it is dipped in zinc chloride solution, dried and heated in a tubular furnace in the absence of air at about 700–800° C. 26% Distillate—tar containing 12% phenol and 52% residual of carbon are obtained. The carbon is cooled, treated with sulphuric acid, washed, dried and ground. The ground sample is found to be a good absorbent of color of jaggery solution. Further detailed investigation on the distillation of lignite under different conditions, especially at higher temperatures and in the presence of steam are under programme of work.

1. *Index to Records, G.S. I.*, T. H. D. La Touche, 1936, **1-65**, 338–39; *Memoirs*, **1-54**, T. H.D. La Touche, 1932, 201–202. 2. *Rec. G. S. I.*, 1924, **55**, 241. 3. Pitchamuthu, C. S., *Dept. of Industries Bulletin No.* **26** (*Travancore*). 4. *Rec. G.S.I.*, **16**, 9, 102; *Rec. G.S.I.*, **15**, 98, 99. 5. *Industrial Fats and Waxes*, by Hilditch, Y., **149.**

LETTERS TO THE EDITOR

ON PRIMES WITH MAXIMUM RECURRING PERIODS FOR THEIR RECIPROCALS

1. It is well known that the reciprocal of a prime number q, when expressed in decimals, has a pure recurring period of p digits where p is a factor of (q-1). When $p=q-1$, the prime is said to be one with maximum period for its reciprocal. The first six such primes are given by Hardy and Wright[1] with the remark that very little is known about them. In 1945, I gave a necessary and sufficient set of conditions[2] for q to be such a prime, *viz.*, that $10^{(q-1)/p} \pm 1 \pmod q$ for all prime factors p of (q-1) and reduced this set to a single condition in the particular case where q is a prime of the form $1+2^{\alpha}3^{\beta}$. It is regrettable to note that in 1947 a false criterion was published by R. V. Iyer in the Bombay University Journal[3] which may, however be rectified thus: For $q=1+2^{\alpha}p$ where p and q are primes $q \pm 137$, $\alpha < 22$, necessary and sufficient condition for $1/q$ to have a maximum period is $10^{(q-1)/2} \equiv -1 \pmod q$. This follows from the fact that prime factors of 10^m-1 (when $m < 21$) of the form $1+2^{\alpha}p$ are 3, 7, 23, 53, 137, p being a prime.[4] This single criterion suffices to show that 233, 263, 269, 383 and 389 are primes whose reciprocals have maximum recurring periods.

2. We now give a single necessary and sufficient condition applicable to all cases in the form of a theorem:

If $q=1+2^{\alpha_0}p_1^{\alpha_1}p_2^{\alpha_2}\ldots p_r^{\alpha_r}$, $P=p_1p_2p_3\ldots p_r$, $Q=(p_1-1)(p_2-1)\ldots(p_r-1)$ *and* $10^{(q-1)/2} \equiv t \pmod q$, *where* q, $p_1, p_2, \ldots p_r$ *are odd primes, then a necessary and sufficient condition for* q *to be a prime with a maximum recurring period for* 1/q *is that* t *satisfies a cyclotomic congruence equation of degree* Q *and order* 2P.

The proof of this is immediate from my criterion[2] if we remember that $t^{2P} \equiv 2 \pmod q$ but $t' \not\equiv 1 \pmod q$ for any factor f of 2P. For example; when $q = 2^{\alpha}3^{\beta}5^{\gamma}+1$ and $10^{(q-1)/30} \equiv t \pmod q$, $1/q$ will have a maximum recurring period or not according as t satisfies or does not satisfy the cyclotomic congruence equation

$$x^8+x^7-x^5-x^4-x^3+x+1 \equiv 0 \pmod q.$$

For the prime 151, $10^5 \equiv 38 \pmod{151}$ but 38 does not satisfy the above congruence equation. In fact the period for 1/151 is 75. For the prime 61, $10^2 \equiv 39 \pmod{61}$ and 39 satisfies the congruence equation, and therefore 1/61 has a maximum recurring period of 60 digits. In fact, the recurring decimal for 1/61 is 01639344 26229508196721311475409836065573770491803278688524 59.

3. Lastly we note that $10^{(q-1)/2\alpha_0} \equiv 1 \pmod q$ is the necessary and sufficient condition for

the recurring period to be odd for $1/q$, while $10^{(a-1)/2a} \equiv -1 \pmod{q}$, $(1 \leqslant a \leqslant a_0)$ is the necessary and sufficient condition for the period of $1/q$ to be even.

A. A. KRISHNASWAMI AYYANGAR.

Mysore,
September 3, 1948.

1. Hardy, G. H., and Wright, E. M., *An Introduction to the Theory of Numbers, 2nd Edition*, 1945, 114. 2. Krishnaswami Ayyangar, A. A., and Kaprekar, D. R., *Journal Bombay University*, 1945, **14**, part 3, 8. 3. Venkatachalam Iyer, R., *Journal Bombay University*, 1947, **15**, part 5, 9. 4. Rollett, A. P., *Math. Gazette*, 1937, **21**, 411.

REPLACEMENT OF TEETH IN *GAVIALIS*

IN *Current Science* for April 1943 reasons were given for the belief that the teeth of *Gavialis gangeticus* were seldom lost and replaced and the presence of many damaged teeth in old crocodiles likewise suggests that replacement does not occur in old age.

It is contended that this point of view overlooks the presence of dental germs and takes note merely of the three macroscopic rows of teeth as seen in the dissected jaw of mature specimens, but the assumption of constant succession still requires experimental proof.

Professor L. Berner of Marseilles has directed my attention to the arresting of growth of the canines by gastration of the wild boar, *Sus serofa* L., and animals where the primary teeth are shed immediately after they erupt or are lost early in life, as in most Mammals.

It would appear that the existence of other rows of teeth than the three commonly noted in crocodiles and gavials has fostered the conception of constant succession and there is need for teeth to be marked in other specimens and kept to determine how long they function.

Britannia Buildings, F. G. CAWSTON.
Durban,
August 5, 1948.

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PHOSPHATE FROM BAGASSE ASH

BAGASSE has been largely used as a fuel, but its ash is discarded. It contains phosphate in an unavailable form. The present investigation was undertaken to find out how the phosphate could be converted into an available form for use as a phosphatic manure.

The bagasse for this work was obtained from the Kolhapur Sugar Mills. 1 Kg. of it yielded 40 gm. of ash.

On chemical examination, the ash was found to contain nearly 1·6 per cent. phosphate (calculated as P_2O_5) ; calcium, magnesium, potassium, and aluminium and iron (the last two calculated together as oxides) being respectively, 3·38, 0·0021, 0·0031, and 0·008 per cent. The rest was silicious matter.

The phosphate content of ash treated with hot water under pressure, with alkalis, and with mineral acids were estimated.

Quantities of distilled water were added to known weights of the ash in different test tubes, and heated in an autoclave at 120° C. at 15 lbs. for half an hour. The filtrates from these gave no test for phosphate.

Known weights of the ash were also treated with mineral acids and with sodium carbonate. The phosphate content of the filtrates are given in the following table.

TABLE

Wt. of ash gm.	Treated with	Treatment	Percentage of phosphate as P_2O_5 in filtrate
1	2 c.c. H_2SO_4 con.	No heating. Only kept aside for 24 hours.	1·60
1	3 ,, ,,		1·60
1	5 ,, ,,		1·60
1	5 ,, ,,	Heated on water bath for 1 hour	1·60
25	50 c.c. HCl (1 : 1)	Refluxed for 2 hours	1·60
5	5 gm. Na_2CO_3 in 100 c.c. water	Boiled for 15 minutes	0·55
5	2 gm. solid Na_2CO_3	Fused, and extracted with water	1·59

The phosphate was estimated by precipitating it as ammonium phosphomolybdate. The precipitate, after filtering and washing, was treated with a known excess of an alkali solution, the excess of which was determined by back-titration with standard acid.

These experiments suggested the possibility of using bagasse along with firewood rich in potash as a mixed fuel in boiler furnaces so that the resultant ash may contain soluble phosphate, and hence serve as a valuable fertilizer.

Accordingly, 1 part of bagasse and 3 parts of *Justicica picta*, locally known as "adulsa" were burnt together and subjected to prolonged heating for about 4 hours in the laboratory.

The mixed ash extracted with hot water contained 0·343 per cent. phosphate, in the filtrate.

A possible setback in such a procedure would be the presence in firewood of minerals yielding interferring ions. Similarly, the heat obtained from the petrol gas in the present instance may not have been enough to bring about the necessary fusion. But these experiments have shown a possibility which may turn out to be of importance.

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30th *May* 1948.

NUCLEIC ACID AND BACTERICIDAL ACTION OF PENICILLIN

THE remarkable antibiotic properties of penicillin have caused attention being directed towards a study of its mode of action,[1–5] but hitherto, a correct explanation of its action is not available. The recent reports of Pandalai

TABLE I

Effect of additions of nucleic acid to penicillin in nutrient broth

(4·5 ml. nutrient broth made upto 5 ml. after additions of nucleic acid and penicillin were made ; pure crystalline penicillin G., dissolved in phosphate buffer pH 7·0 was added wherever indicated ; incubated for 24 hours after inoculation with a 1 mm. loopful of a 1/1000 dilution of a 24-hour old culture of *Staphylococcus aureus*—FDA Strain).

Concentration of Nucleic acid	Penicillin in Oxford units per ml. of broth											
	0	0·05	0·1	0·2	0·3	0·5*	0	0·05	0·1	0·2	0·3	0·5*
	Incubated at 24° C.						Incubated at 37° C.					
Control—No Nucleic acid	++++	−	−	−	−	−	++++	−	−	−	−	−
Nucleic acid—Free acid												
1/10,000 ..	++++	−	−	−	−	−	++++	±	−	−	−	−
1/5,000 ..	++++	−	−	−	−	−	++++	±	−	−	−	−
1/2,000 ..	++++	−	−	−	−	−	++++	+	−	−	−	−
1/1,000 ..	++++	±	−	−	−	−	++++	+	−	−	−	−
1/500 ..	++++	±	−	−	−	−	++++	++	−	−	−	−
1/200 ..	++++	±	−	−	−	−	++++	++	−	−	−	−
Nucleic acid—Sodium Salt												
1/10,000 ..	++++	−	−	−	−	−	++++	−	−	−	−	−
1/5,000 ..	++++	−	−	−	−	−	++++	−	−	−	−	−
1/2,000 ..	++++	−	−	−	−	−	++++	−	−	−	−	−
1/1,000 ..	++++	−	−	−	−	−	++++	−	−	−	−	−
1/500 ..	++++	−	−	−	−	−	++++	−	−	−	−	−
1/200 ..	++++	−	−	−	−	−	++++	−	−	−	−	−

* Experiments with concentrations of penicillin up to 16 units per ml. have been carried out and the results were just the same as when only 0·5 unit of penicillin per ml. was added.

and George[6,7] that nucleic acid in small concentrations causes an antagonistic action against penicillin is of special interest in this connection and merits careful re-investigation.

We have, therefore, studied the effect of additions of yeast nucleic acid (B.D.H. pure sodium salt and Merck's pure nucleic acid) in concentrations varying from 1/10,000 to 1/200 to broth containing penicillin at concentrations varying between 0·05 and 16 Oxford units per millilitre.

The results of these experiments are summarised in Table I.

It will be seen from these results that, when nucleic acid was used as the free acid and in concentrations at and above 1/2000, there was a small growth in tubes in which penicillin was added in concenfrations of 0·05 O.U./ml. but not when higher concentrations of penicillin were present. The presence of nucleic acid—free acid or the sodium salt-did not affect the bactericidal action of penicillin when the antibiotic was present in concentrations greater than 0·05 O.U./ml.

The absence of appreciable growth in similar tubes incubated simultaneously at 24° C. indicated the possibility that in the presence of nucleic acid, penicillin in very small concentrations is probably destroyed—more so at 37°C.—and hence the antagonistic effect of nucleic acid on penicillin as reported by Pandalai and George.[6,7] This is explained by the fact that nucleic acid (free acid) in solution has a pH of 4·0-4·4 and when added to broth at pH 7·0, brings down the pH to as low as 5·2-5·5 and at this pH and when incubated at 37° C. small concentrations of penicillin are fairly easily destroyed.[8] This, however, is not the case when nucleic acid is added after neutralization to pH 7·0 with alkali or when it is dissolved in phosphate buffer at pH 7·0. Thus, it is clear that nucleic acid does not reverse the bacteriostatic action of penicillin as reported by Pandalai and George.[6,7]

We wish to express our thanks to Major-General Sir S. S. Sokhey, Director, for his kind interest in the work.

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August 30, 1948.

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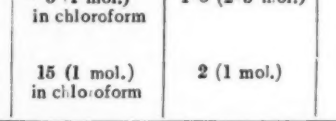
ACTION OF DIAZOMETHANE ON TRIACETYLGALLOYL CHLORIDE

In the course of our attempts to synthesize 5-hydroxyadrenaline it was found necessary to prepare *w*-chloro-3,4,5-triacetoxy acetophenone (I).

3, 4, 5 $(CH_3COO)_3C_6H_2-CO-CH_2Cl$ (I)

3, 4, 5 $(CH_3COO)_3C_6H_2-CO\cdot CHN_2$ (II)

Nierenstein and co-workers[1,2] have shown that *w*-halogenated acetophenones are formed by the action of diazomethane on aromatic acid chlorides. But our attempts to prepare (I) by the application of Nierenstein's reaction always yielded only the corresponding diazoketone (II) in good yield. A search in the literature revealed that Robinson and his collaborators had prepared (II) by the action of diazomethane on triacetylgalloylchloride and that the Robinson school[4,5] had differed in their views from those expressed by Nierenstein with regard to the mechanism of reaction between aromatic acid chlorides and diazomethane. Comparing his reaction with Schlotterbeck reaction[6], Nierenstein[1,2], explained the formation of the chloroketone as follows:



On the other hand, Robinson and his collaborators (*loc. cit.*) who obtained diazoketone as the major product, explained the reaction mechanism as follows:

$R-CO.Cl+CH_2N_2 \rightarrow R-CO\cdot CHN_2 + HCl$ (A)

$CH_2N_2 + HCl \rightarrow CH_3Cl + N_2$ (B)

$R-CO\cdot CHN_2+HCl \rightarrow R-COCH_2Cl+N_2$ (C)

But, unlike Nierenstein, Robinson and coworkers *had added the acylchloride (1 mol.) to the diazomethane solution (2 mols.)* whereby the tendency for the non-formation of the chloroketone might be dominant. A systematic study of the action of diazomethane on triacetyl galloyl-chloride has now been undertaken following Nierenstein's procedure.

In general, the experimental procedure was, *to add the diazomethane solution dropwise to the acid chloride* and not the sacid chloride to the diazomethane solution as in Robinson's procedure, with good stirring. The diazoketone separated out at the end of the reaction and was purified by crystallisation from alcohol. Experiments were conducted with varying proportions of diazomethane and triacetyl galloylchloride at 0°C. and at 23-26°C. But the product obtained was invariably the diazoketone (M.P. 125-126°C.) which on treatment with alcoholic hydrogenchloride or hydrogenbromide, gave the desired chloro-or the bromoketone respectively.

It was also found that triacetylgalloyl chloride could be prepared in a more facile manner by the action of thionyl chloride than by the action of phosphorus pentachloride[7] on triacetylgallic acid. The present work supports Robinson's explanation for the mechanism of the Nierenstein reaction.

The results of some typical experiments are tabulated in the table.

TABLE

No.	Triacetyl galloyl chloride g.	Diazomethane in Ether g.	Temperature of reaction °C.	Experimental details	Yield of *w*-diazo-3, 4, 5-triacetoxy acetophenone (II)
1	3 (1 mol.) in ether	0·48 (1·2 mol.)	23-6	Kept overnight after the addition	1·4 g. (46%)
2	50 (1 mol.) in benzene	10 (1·5 mol.)	23-6	Kept overnight	13·5 g. (27%)
3	5 (1 mol.) in chloroform	1·5 (2·3 mol.)	0	50 c.c. of the etherial solution of diazomethane added at °C. and 30 c.c. of it added at the ordinary temp. all at once	5 g. (Theoretical)
4	15 (1 mol.) in chloroform	2 (1 mol.)	23-6	Diazomethane solution added with mechanical stirring	8 g. (53%)

Organic Chemistry Laboratories, Indian Institute of Science, Bangalore, *April* 1, 1948.

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WATER-MELON AND FOOD-POISONING

2. The Viability of the Test Bacteria in the Juice

Bacteria of the food-poisoning group have been reported to proliferate[1] in the watermelon juice at a more rapid rate than the other tested intestinal bacteria; this may account for the outbreaks of food-poisoning through this source. Experiments on the viability of these bacteria in the juice, as the following results will reveal, substantiate fully the above observation.

For the experimental purposes the juice was collected in 10 *ml* quantities in sterile test tubes and was tested for sterility before use. Likewise, the initial pH of the juice was also

determined electrometrically. Duplicate sets of the tubes were then seeded with 0·1 *ml* saline-suspensions of the test bacteria, *viz.*, *E. typhosa*, *S. paratyphi*, *S. schottmuelleri*, *S. enteritidis* and *E. coli communis*, all the strains being the type cultures referred to previously.[1] Control tubes (uninoculated) were also maintained in every experiment. All the tubes were then incubated at the room temperature (30-31° C.) after 2-*mm* loopful from each tube was removed for inoculation on the MacConkey's agar slope. After 24-hrs. a loopful from each tube was again utilized for viability test on the same medium and another loopful was used for the inoculation of meat-infusion broth tube for securing more sensitive results. Further 1 *ml* aliquots removed aseptically from every tube was plated out with 9 *ml* of MacConkey's agar for confirmatory results. All the media so inoculated were incubated at 37° C. and the results read after 24 and 48 hours. In a similar way the viability tests were carried out after 48, 72, 96 and 120 hours of incubation of the juice samples at the room temperature.

From the duplicate sets of the seeded juice samples, one set was boiled for 10 minutes after 24-hrs. of incubation and the pH of the juice in every tube was determined. These readings indicated the changes produced in the initial pH of the juice as a result of the 24-hr. metabolic activities of the different bacteria. The other set (employed for the viability tests) together with the control tubes were subjected to heating and pH determination only after 120 hours, *i.e.*, after the test bacteria had completely disappeared from the juice. Altogether five different samples of the juice were examined in this manner. Since the initial pH and the results obtained in two of the cases overlap each other, the details of only four experiments are tabulated below.

Expt.	Species	pH			Viability in hrs.
		Initial	24 hrs.	Critical	
1	T	5·56	4·49	4·00	48
	A	,,	4·44	3·86	48
	B	,,	4·78	3·98	120
	E	,,	4·66	3·93	48
	C	,,	4·36	3·86	72
	Control	,,	5·56	(5·55)*	..
2	T	5·59	4·55	4·00	48
	A	,,	4·52	3·92	48
	B	,,	4·68	3·85	120
	E	,,	4·68	3·92	48
	C	,,	4·95	4·01	72
	Control	,,	5·59	(5·58)*	..
3	T	5·88	4·59	4·10	48
	A	,,	4·48	3·86	48
	B	,,	4·73	3·81	96
	E	,,	4·66	3·85	48
	C	,,	4·92	3·85	72
	Control	,,	5·88	(5·87)*	..
4	T	6·10	4·61	4·12	48
	A	,,	4·51	3·98	48
	B	,,	4·71	3·87	120
	E	,,	4·69	3·97	48
	C	,,	4·99	3·99	72
	Control	,,	6·10	(6·10)*	..

Legend: T = *E. typhosa*; A = *S. paratyphi*; B = *S. schottmuelleri*; E = *S. enteritidis*; C = *E. coli*, ( )* = Final pH.

The results indicate clearly that the death of the organism, in every instance, is attributable to a fall in pH, which is in agreement with that of Mackenzie[4], and it is interesting to note here that this fall in pH is more gradually registered in the case of *S. schottmuelleri*, *S. enteritidis* and *E. coli* as compared to the other two species; but still we find that the critical pH, which actually is responsible for the disappearance of the cells, is sooner reached in the *Eberthella* and two of the *Salmonella* species rather than in *S. schottmuelleri* and *E. coli*. *S. schottmuelleri* thus appears to be the more tolerant of the species in the genus and this is in agreement with the observation made before[2] in connection with sugarcane juice. Moreover the higher incidence of this species in the intestinal disturbances[3] in this part of the country, together with the observation that this organism can not only multiply at a very rapid rate in the water-melon juice but also retain all its cultural and antigenic characteristics, strongly suggest its possible association with the outbreaks of food-poisonings.

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A MOSAIC DISEASE OF *CARICA PAPAYA* L. IN THE BOMBAY PROVINCE

A MOSAIC disease of *Carica papaya* first collected in March 1947 at Bombay was later observed in June 1947 in a nursery at Poona, where majority of the papaya plants growing at the time were seriously diseased. Typical mosaic symptoms in the diseased plants suggested the possibility of a virus being involved. This was confirmed on transmission of the disease by sap inoculation to healthy papaya seedlings raised from seed in the insect-proof glasshouse. The serious nature of the disease and the rapidity with which it was spreading to the neighbouring papaya plantations warranted its immediate investigation. This note deals briefly with the symptoms, the virus, its transmission in nature and the possible line of control.

Under insect-proof conditions in the glass-houses at Poona, papaya plants invariably showed the first symptoms of disease in the form of solid dot-like necrotic spots all over the lamina of the new developing leaf in about 20 days following inoculation. Use of 600-mesh fine carborundum powder as an abrasive gave a higher percentage of infection and the disease symptoms also appeared a little earlier

than in those plants which were inoculated without the use of the abrasive.

Leaves of a fully diseased plant develop well marked mosaic symptoms with blister-like patches of green tissue distributed indiscriminately all over the yellowish green lamina (Fig. 1). Leaf petiole is greatly reduced in size and the lamina, though reduced, is occasionally malformed. Conspicuous and elongated water-soaked areas are formed on the stem and petioles, while the top leaves assume an upright position due to which the diseased plants stand out from healthy ones in a garden.

FIG. 1. A leaf of a diseased *Carica papaya*, showing typial mosaic symptoms.

Fruits produced on diseased plants are few, elongated and smaller than those borne on healthy ones. Innumerable circular or concentric water-soaked lesions with a central solid spot appear all over the surface of fruits due to which they lose their market value.

The virus is quite unstable and appears to be of the non-persistent type. It loses infectivity after storage *in vitro* for 28 hours in the laboratory, withstands heating for 10 minutes at 53° C. but not at 55° C., and retains infectivity at a dilution of 1 in 1,000.

The virus is sap-transmissible, and is not carried in the seed. Out of 450 seeds from a diseased fruit sown, 340 germinated and produced only healthy seedlings. The disease has also been successfully transmitted by *Aphis gossypii* Glover collected from cotton and Brinjal, *A. malvae* Koch. collected from *Lagenaria vulgaris* Ser., *Aphis* sp. collected from *Euphorbia prolifera* and *Myzus persicae* Sulz. collected from *Brassica* sp. The banana aphis, *Pentalonia nigronervosa* Coq. and the white fly, *Bemisia tabaci* Genn., failed to transmit the disease. Although papaya plants in Poona are almost free from insects, yet it appears certain that the transmission of the disease in nature is accomplished by one or more of the four aphids which not only abound in large numbers in and around papaya plantations but are also air-borne.

Two virus readily infects *Carica papaya* varieties Washington Special, Honey Dew, Hawaiian, Ranchi, Ceylon, Bombay, Poona Long and Poona Round, *Lagenaria vulgaris* and *Cucumis sativus* L., but did not cause disease in *Nicotiana glutinosa*. In *L. vulgaris* and *C. sativus* symptoms of the disease appear as faint vein-clearing in patches accompanied with slight distortion of leaves. Typical mosaic symptoms are never exhibited.

Two distinct virus diseases of papaya have been reported so far. Cook[1] first described 'bunchy-top' of papaya from Porto Rico and later Ho and Li[2] observed it in the Kwangtung province, China. Oman[3] believed that bunchy-top was possibly transmitted by *Empoasca papayæ*. This was confirmed by Adsuar.[4] A similar type of disease transmitted by inarch grafting was reported from Coimbatore by Thomas and Krishnaswami.[5] Parris[6] observed a mosaic disease of papaya in Hawaii and found that it was transmitted by mechanical abrasion and inarch grafting but not by scion grafting.[7] Diseases of doubtful origin have also been recorded by Simmonds[8] and Baker.[9] The mosaic disease of papaya recorded in this note seems to be caused by a virus distinct from those reported so far.

The only line of control helpful in checking the further spread of the disease lies in thorough destruction of all diseased plants and this measure should be rigidly enforced in order to save papaya cultivation from complete extinction.

Further work on the host range and insect transmission is in progress.

Grateful acknowledgements are due to Dr. B. N. Uppal for helpful encouragement. This investigation is being carried out under a scheme financed by the Indian Council of Agricultural Research.

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August 7, 1948.

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* Original papers not seen.

PHYTOPATHOLOGICAL EXAMINATION OF SEEDS BY ULSTER METHOD

SEEDS of four types of groundnut, four types of tobacco and two types of castor were received by me from the Economic Botanist (Oilseeds) to Government, U.P., for the issue of phytopathological certificates, as these seeds were

TABLE I

Percentage of healthy seeds and of various fungi obtained from seeds of different types of groundnut, tobacco and Castor.

Arachis Hypogea Linn. (GROUNDNUT)					*Nicotiana Tabacum* Linn. (TOBACCO)					*Ricinus Communis* LINN. (CASTOR)		
Fungi	Type (T. 25)	Type (T. 4110)	Type (R2)	Type (T. 9)	Fungi	Type (Napani Surti)	Type (H.S. Chirala)	Type (I.P. 28)	Type (F.D. Local	Fungi	Type (T. 3)	Type (T. 12)
Fusarium Sp.	25	20	10	97	*Aspergillus niger* van Tieghem	11	8	5	49	*Cercosporina ricinella* (Sacc. & Berl.) Speg.	26	29
Rhizoctonia solani Kuhn	30	5	2	1	*Aspergillus* sp.	4	2	0	7	*Aspergillus niger* van Tieghem	74	71
Cercospora personata (B. & C.) Ellis	25	25	10	0	*Fusarium* sp.	0	0	2	0	Healthy seeds	0	0
Aspergillus niger van Tieghem	10	50	75	2	*Alternaria* sp.	0	0	0	5			
Aspergillus sp.	10	0	3	0	Sterile fungus	2	0	0	9			
Healthy seeds	0	0	0	0	Healthy seeds	83	90	93	30			

to be exported to China as required by the Director of Agriculture, China. Randomized samples of 100 seeds from each type were examined after plating out ten seeds kept at an equal distance from each other in each plate containing 10 c.c. of 2 per cent. malt extract agar medium after incubating them for five days at the room temperature according to Ulster method as given by Muskett and Malone (1941). The data are given in Table I. The per centage of parasitic fungi in different types of groundnut, *viz.*, T. 25, T. 4110, R2 and T. 9 was 80, 50, 22 and 98. The per centage of healthy seeds in different types of tobacco, *viz.*, Napani Surti, H. S. Chirala, I.P. 28 and F. D. Local was 83, 90, 93 and 30. The percentage of parasitic fungi in castor, Type T. 3 was 26 and in Type 12 was 29.

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July 30, 1948.

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DODDER OR LOVE VINE ON BERSEEM IN U.P.

THE dodders or love vines are of importance in foreign countries as pests of clover, alfalfa and flax. Some of the common names are "strangleweed", "goldthread", "hairweed", "pulldown", "hailweed", "devil's-hair", "devil's ringlet", "devil's-guts" and "hellbind".

These belong to the single genus *Cuscuta*, of the *Cuscutaceæ*, a family very closely related to the *Convolualaceæ* or morning glory family. Perhaps the ancestral habit of the genus of twining around other plants for support lead to the permanent habit of parasitism. According to Yuncker (1932) there are 158 species of *Cuscuta* on a great variety of hosts. In the month of April 1948 the whole canal irrigated crop of berseem grown partly for fodder and partly for seed purposes at the Government Agricultural Farm, Haldwani (District Naini Tal), U.P., got severely affected by dodder, *Cuscuta arvensis* Bey. This is the first record of dodder *Cuscuta arvensis* Bey. on berseem (*Trifolium alexandrinum*) from the United Provinces. It may have been introduced into this farm through irrigation water or seed. The contaminatad seed is generally the first source of infections, but after that other means of spread, *viz.*, (i) by hay from infested field, (ii) contaminated manure and (iii) by farm operations and (iv) the movement of livestock. It is carried over from one season to another either by seed or by established stems on perennials.

Control.—At first it is necessary to pay full attention to practices to prevent introduction of dodder, and if present to guard against its spread by (1) the selection of dodder-free seed; (2) the avoidance of dodder infested berseem fodder; (3) preventing the movement of grazing animals from infested to clean fields; (4) restricting the flow of irrigation water so as to avoid passing through infested areas, (5) avoidance of the use of dodder-containing

manure, (6) destruction of the crop by burning before seeding and (7) by leaving the ground fallow after the selected eradication measures have been completed and then followed with a five-years rotation beginning with a non-leguminous tilled crop.

The seeds of *Cuscuta arvensis* Bey are much smaller in size than berseem seeds and these could be separated by means of suitable sieves. In U.S.A. the separation of dodder from commercial seeds is now generally done by seed companies provided with special cleaning machinery. Three types of cleaners are in use; (1) power driven graders with special screens, (2) the Dosser machine, in which the velvet linings retain the small dodder seed that cannot be screened out and (3) by an electromagnetic process, in which the crop seed is mixed with iron powder. Much of the powder sticks to rough dodder seed which is then drawn out of the crop by magnets.

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July 30, 1948.

Yuncker, T. G., *Mem. Torry Bot. Club*, 1932, **18**, 113-31.

XANTHOMONAS DESMODII—GANGETICII, SP. NOV., UPPAL, PATEL AND MONIZ; A NEW BACTERIAL LEAF-SPOT OF *DESMODIUM GANGETICUM* DC.

THE disease appears as light yellow, watersoaked, round spots on the undersides of leaves of *D. gangeticum* found at Bassein in Thana District where it seems to be localised. It differs from other bacterial leaf-spots on legumes in its host range, morphological, cultural and biochemical reactions. The description of the pathogene causing this leaf-spot is as under:—

Short rods with rounded ends, single or in pairs but never in chains. Capsules present. Motile with a polar flagellum. Gram-negative. No spores and non-acid fast. Stains readily with gentian violet, carbol fuchsin and methylene blue. Colonies on potato dextrose agar are circular with entire margins, smooth, convex, glistening and butyrous. Odour is absent and colour of the medium remains unchanged. Colour of the colonies is empire yellow. Internal markings (striations) not coming upto the margin. Moderate cloudiness in nutrient broth with no floccules and pellicle. Colour remains unchanged and odour is absent. Optimum temperature for growth is 20°-25°C., minimum about 5°C. and maximum about 35°C. Thermal death point is between 50° and 52°C. The organism liquefies gelatin and has a strong diastatic action on starch. Casein is digested. Nitrates are not reduced and indole and ammonia are not produced. Hydrogen sulphide produced. Asparagin utilised as a sole source of carbon and nitrogen. Litmus reduced in litmus milk and plain milk is cleared. Utilises dextrose, sucrose, raffinose, galactose, maltose, xylose, lactose, arabinose, levulose, mannitol and salicin. Growth good in Uschinsky's solution; no growth in Cohn's and Koser's uric acid medium.

The organism is pathogenic to *Desmodium gangeticum* DC.

A detailed paper is being submitted separately for publication.

Plant Pathological Laboratory, M. K. PATEL.
College of Agriculture, L. MONIZ.
Poona,
August 20, 1948.

PRELIMINARY OBSERVATIONS ON THE ROLE OF BLUE GREEN ALGÆ IN FISHERY PONDS AND IN THE CONTROL OF MOSQUITO BREEDING*

IT has now been realised that for tackling the urgent problem of increased fish supplies in the country, a rapid extension of fish culture through the utilisation of the neglected village ponds is one of the most hopeful ways. Public Health authorities interested in the control of mosquito breeding spray the same ponds with insecticides at frequent intervals and thereby make the ponds ineffective for fish culture. Thus there is great need at present for co-operative research with a view to integrating malaria control with fish culture.

In the course of a scheme of co-ordinating anti-malarial measures with pisciculture, Blue Green Algæ were found to play an important part.

It was observed that the fish culturists very often plant Blue Green Algæ [1,2] in nursery ponds in order to ensure a quick and healthy growth of carp fry. The utility of algæ as food for Indian Carps, has already been noted by Mookerjee[4] and Biswas[5]. The latter found that Blue Green Algæ "either epiphytic on the submerged water plants or floating freely as plankton serve as food to mosquito larvæ" while Senior White regards Blue Green Algæ as "inimical to *Anopheles* larvæ," (private communication). The observations recorded here will show that the growth of these algæ is inimical to the breeding of *Anopheles* larvæ.

Experiments have shown that Blue Green Algæ in a pond influences the pH of the water. The following table indicates the relative growth of Blue Green Algæ and the pH of water.

Correlation between the relative growth of Blue Green Algæ and the pH of water.

pH	Cases of algal frequency				
	Nil	Very thin	Thin	Thick	Total
8·0 to 8·4 ..	445	42	28	8	523
8·5 to 8·8 ..	11	3	10	24	48
Above 8·8 ..	0	0	0	12	12

The particular species found in these tanks is *Mycrocystys aeruginosa* (Kutzing)‡

pH value in relation to Mosquito Breeding

Sen[3] has pointed out that *Anopheles sundaicus* does not breed in waters above pH 8·5, average pH suitable for its breeding being 8·2. If along with the manuring of waters, attempts could be made, either by the introduction of Blue Green Algæ, or by Chemical treatment, to keep the pH of the pond water between 8·5 and 8·8, healthy growth of fish could be ensured, and at the same time breeding of a *A. sundaicus* checked.

It appears that use of soap solution, while beneficial for the growth of fish, is inimical to *Anopheles*. This is also the experience of fish culturists in Bengal.

The other malaria vectors of Bengal, *A. philippinensis*, *A. culicifacies*, etc., do not breed in organically polluted waters. So, in scientifically maintained fishery ponds, they should have no chance of breeding.

Mr. S. Roy Chowdhury, Statistician to the Directorate of Fisheries, Bengal, has very kindly analysed the data given in the above table statistically and confirms the relationship between the growth of algæ and the pH.

After the above note was prepared for publication, a very interesting article by Fogg[6] on "Nitrogen fixation by Blue Green Algæ" (pp. 172-75, 1947) has come out wherein the ability of certain species of Blue Green Algæ for fixing atmospheric Nitrogen is pointed out, thereby contributing to the maintenance of the fertility of tropical soils and the productivity of fresh water. In Blue Green Algæ, nitrogen and carbon assimilation proceed side by side in the same cell. As Fogg puts it, "In combining the nitrogen-fixing and photosynthetic modes of nutrition, blue green algæ resemble the legume-nodule-bacteria system".

It would appear that by providing the optimum conditions for the growth of Blue Green Algæ, the assimilable nitrogen contents of the water could be increased to the benefit of fish culture and malaria-control. There is hence good scope for a useful line of research on this aspect which would be of interest both to pisciculturists and malarialogists.

Directorate of Fisheries, Bengal, Calcutta, *August* 9, 1947. S. R. Das Gupta.

1. Walch, E. W., Van Breeman, M. L., and Reyntjes, E. J., *Meded. Dienst. Volksgez. Ned-Ind.*, 1930, **19**, 400. 2. Hackett, L. W., Russell, P. F., Scharff, J. W., and Senior White, R., *Quart. Bull. Health Organisation of League of Nations*, 1937, 31. 3. Sen, P., *J. Mal. Inst. Ind.*, 1938, **1**, 259. 4. Mookerjee, H. K., *Cal. Review*, 1942, 228. 5. Biswas, K. P., *Science and Culture*, 1942, **8**, 189. 6. Fogg, G. E., *Endeavour.*, 1947, **6**, 172–75.

* Published with the kind permission of the Director of Fisheries, Bengal.

‡ My thanks are due to Miss Eva Mitra for identifying the species.

STUDIES IN EXPERIMENTAL INSECT PARASITISM
SUPERPARASITISM

Bracon (Microbracon) gelechiæ Ashm., is an ectoparasite of the larva of the potato tuber moth, *Gnorimoschema operculella* Zell., which has recently been imported into India from Canada, for the control of the potato tuber moth, a serious pest of potatoes in storage in India. This parasite is bred in large numbers on the larvæ of *Corcyra cephalonica* St., in the Parasite Laboratories of the Indian Agricultural Research Institute, New Delhi.

In the course of experimental studies on the host selection by *Bracon gelechiæ*, it was observed that superparasitism had a direct bearing on (1) the size of individuals bred, (2) the number of adults bred per host and (3) the sex ratio of the resulting offsprings. It was found that superparasitism as a result of overcrowding of adult parasites in the oviposition cages is one of the causes of the low rate of breeding of *B. gelechiæ*.

Superparasitism and size and vigour of individuals

In cases where more than one parasite grub shared a single host it was found that as the number of parasite grubs per host increased, the size of the individual parasites decreased and in certain cases, degenerate forms (Figs. 1, 2 & 3) appeared as a result of overcrowding

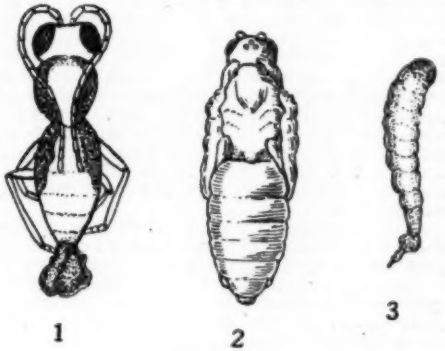


FIG. 1. Undeveloped 'Runt' × 15.
„ 2. Undeveloped naked pupa × 18.
„ 3. Degenarated prepupa × 15.

and consequent insufficiency of food. These degenerate forms on "runts" as described by Salt were very inactive, short lived, and in all cases, died before laying eggs. Structural deformities, such as modified antennal segments and reduced wings were very pronounced in many cases (Fig. 1). In certain cases, the parasitic grubs, instead of spinning cocoon, turned into naked pupa (Fig. 2) which did not develop into adults.

Superparasitism and sex ratio

It was also observed in the course of these studies that the number of parasite grubs sharing a single host for their development had a direct bearing on the sex ratio of the adults

that emerged. Table I gives the sex ratio of adults which emerged from parasite grubs in different intensities of superparasitism on the larva of *Corcyra cephalonica* and also the average duration of the developmental period under the different conditions.

TABLE I

No. of parasite grubs per host	Adults bred		Mean No. of days taken for emergence from egg to adult
	Percentage Males	Percentage Females	
1	33·4	66·6	8·6
2	16·7	83·3	8·3
3	22·2	77·7	9·0
4	25·0	75·0	9·0
5	26·7	73·3	8·3
6	26·7	73·3	9·0
7	57·2	42·8	8·5
8	62·5	37·5	8·5
9	44·5	55·5	11·0
11	63·7	36·3	9·5
18	61·2	38·8	11·0
19	73·7	26·3	11·2
29	82·8	17·2	10·5

It can be seen from the above table that as the number of parasite grubs which share a single host increases, the number of males also increases, or in other words, when the food supply is sufficient more females are produced and this number decreases as the food supply becomes less and less. The intensity of superparasitism depends on the density of female parasites in the ovipositon cage. It may be also seen from the table that as the number of parasite grubs that shared a single host increased the developmental period was prolonged or the emergence of the adult parasites was delayed.

These findings are of considerable interest and also of practical importance in the propagation of insect parasites. Further work is in progress to find out the influence of different species of alternate hosts on the parasite, *B. gelechiæ*. Full details on these studies will be published elsewhere.

Division of Entomology, I.A.R.I., New Delhi, *June* 29, 1948.

E. S. NARAYANAN.
T. V. VENKATRAMAN.
G. C. SEN GUPTA.

1. Salt, *Proc. Roy. Ent. Soc.*, London (A), 1940, **15**, 81–95.

PELLICULARIA FILAMENTOSA (PAT.) ROGERS, COMB. NOV. CAUSING A ROOT-ROT OF BERSEEM (*TRIFOLIUM ALEXANDRINUM* LINN.) IN THE UNITED PROVINCES

IN April 1948 the fungus *Pellicularia filamentosa* (Pat.) Rogers, formerly known as *Rhizoctonia solani* and *Corticium solani* was found causing a severe root-rot of berseem (*Trifolium alexandrinum*) in the United Provinces at the Government Agricultural Farm, Nawabganj (Bareilly). This is the first record of this fungus on berseem from the United Provinces.

In the first week of April 1948 the berseem crop suddenly began to die. The havoc was hastened by the easterly winds that blew during this period. Watering had only an adverse effect. The seed obtained from the fields where infection was severe remained shrivelled up due to the premature drying of the crop. In a number of plants the seeds did not form at all. In some fields the infection was only slight or took place when the seed was mature. The seed obtained from such fields was apparently healthy. The same disease was observed in berseem fields of cultivators situated at some distance from the farm. Usually plants 5″ to 12″ were affected by this disease. In the early stage of the disease the parts attacked are the roots and the crown, where a slight discolouration is produced which gradually deepens to black. By this time the leaves and branches of the plant begin to wither. In a later stage, the bark of the crown dries up. The tap root rots and the development of secondary roots is restricted. In advanced stages very small scattered dot-like structures are formed on and near the crown. These can be seen even by the naked eye. They are the sclerotia. It is through them that the disease is carried from year to year. They are known to remain viable in the soil from four to five years. Hence crop rotation is the only suitable means of controlling this soil borne disease.

I am very much grateful to Dr. U. B. Singh, M.SC., D.PHIL., ASSOC. I.A.R.I., Plant Pathologist to the Government, U. P., for his helpful suggestions and kind interest in going through the manuscript.

Section of the Entomologist, to Government, U.P., Kanpur, *July* 1, 1948.

D. N. GARG.

UNIFORM GLAZED PANS FOR RAISING SUGARCANE SEEDLINGS

AT the Coimbatore Station, countrymade earthenware pots have been used all these years for germinating sugarcane seeds and raising seedlings. Dr. J. N. Mukherjee, Director, Indian Agricultural Research Institute, during his inspection visit of the Station in January 1946 remarked on the patchy character of the variations in the germination and vigour of seedlings and their markedly non-uniform stand in the same pot in which fluff from the same cross was used. The pots have the shape of a truncated conical pyramid with the narrower side resting on the floor. They are not of very uniform size and their bottom surface is uneven. Besides, the bamboo platform on which they rest also sags somewhat and the surface is uneven. All these features combined, in his opinion, to affect the seed-

lings differently in different parts of the pot and it was decided to try for comparison glazed pots of standard cylindrical shape made in the pottery furnaces. In the countrymade pots sometimes water accumulates in certain places and the finer particles sometimes gather in the lower portions as a result of watering. Many seedlings die off or become pale and look sick. The countrymade pots are, however, much cheaper, but this is partly offset by the greater durability of the glazed pots. The glazed pots have shown so striking a difference in the health and vigour of the seedlings that it is considered desirable to bring the difference to the notice of others.

Two different crosses were tried. The pans, as has been the usual practice in this Station, were filled with equal quantities of horsedung and sand in equal proportions and two grams of fluff was sown in each pan and care was taken to see that each pan received the same quantity of water. The pans were kept on level surface and germination counts recorded at intervals of five days till the 25th day. After the 60th day when the seedlings had established themselves, certain of the seedlings were noticed to have died possibly due to competition. The mortality rate was recorded on the 80th day.

Plate I

Earthenware pan Glazed pan

Plate II

Earthenware pan Glazed pans Earthenware pan

The germination percentage was found to be slightly higher in the glazed pans but is not significant. As regards mortality of the seedlings, the difference appears to be significant (5% level) in the batch of seedlings of the cross Co. 453 × Co. 557 and also if both the crosses are taken together. The main difference, as will be seen from the accompanying photograph (Plate I) was in the health, vigour and uniform growth and distribution of the seedlings. The seedlings in glazed pots are vigorous and uniform in growth and distribution and the seedlings at the periphery did not differ in growth from the rest of the pot while the seedlings in the usual pot were not uniform in stand and many of them showed yellowish leaves and the seedlings at the periphery were definitely poor in growth.

A peculiarity that will be noticed in the countrymade pots is that the roots come out of the soil on to the inner surface of the pot but not so in the glazed pots ; evidently owing to the better aeration through the walls of the countrymade pots. The difference in the behaviour may partly be ascribed to greater loss of water through evaporation through the sides of the locally made pots and irregularity in shape. Also, the seedlings near the periphery of the locally made pots have a much lower thickness of the nutrient material available to them.

Sugarcane Breed. Station, N. L. DUTT.
Coimbatore, J. THULJARAM RAO.
August 17, 1948. T. A. DAVIS.

A CHROMOSOME DEFICIENT PADDY TYPE

A STRAIN of the cultivated paddy Muthusamba, which was segregating for barren sterile plants on a simple mendelian ratio, was reported previously[1] in this journal. The segregating form has been grown every year and probable reason for its genetic behaviour studied.

Cytological study of the root tips has given a clue to its causation. The stunted sterile segregants were found to have 22 chromosomes only, as opposed to 24, normal for paddy. This deficiency of two chromosomes is inferred to cause the changed growth as well as complete sterility. It can be seen that the absence of panicle formation can be caused only by a deep-seated cause like this, while lack of grain setting may be due to genetical or pathological causes. The chromosome counts were made carefully with different collections of root tips, done in plants grown in two seasons. Counts were made only in the clearest metaphase plates, and have been checked by independent observers. However, the pollen grains of heterozygous plants do not show dimorphism corresponding to the full and reduced chromosome complements. Confirmation of this explanation is being sought in the meotic stages in the meterozygote.

The inference is that originally, by nondisjunction in meiosis, a gamete with 11 chromosomes (a loss of one from the normal genom of 12.) was formed, and this on fertilisation gave rise to a normal looking plant with 23 chromosomes. This plant gave rise to 24 chromosomed; heterozygous 23 chromosomed; and

sterile 22 chromosomed plants, in 1 : 2 : 1 genotypic ratio, or 3 : 1 phenotypic ratio. The heterozygotes continue to segregate every year, and the further heterozygotes have been grown from them.

The sterile types can be maintained for a long time by vegetative propagation. The deficiency affects the cytological characters of the roots also, giving rise to clumped mitotic plates, and a large number of empty cells even in growing root tips. The interest of the form lies in use of the heterozygote for ultimately preparing a chromosome map of paddy. From general observation it looks as if such deficients do occur, though rarely, and can be secured by careful selection amongst the large amount of material handled at the Paddy Breeding Station. The collection of such types is being started.

The writers are indebted to the Paddy Specialist and his staff, for continuous help in this work.

Agricultural College and Research Institute, Coimbatore, *August* 13, 1948.

S. SAMPATH.
V. KRISHNASWAMY.

1. *Curr. Sci.*, 1934, **3**, 22.

STUDIES IN ANTIMALARIALS

N^1– Aryl-N^5-alkyl-biguanides

FOLLOWING the discovery of Paludrine[1] as a potent antimalarial, sufficient interest was developed in the field of substituted biguanide derivatives as potential antimalarials. The first attempt to improve upon the activity of the parent drug has been to replace its N^1-*p*-chlorophenyl part with phenanthrene and quinoline radicals but all these compounds were found to be inactive when tested against experimental malaria.[2,3] The N^5-isopropyl group of paludrine has been replaced with 5-and-8-quinolyl,[5,6] 2-thiazolyl;[7] *p*-phenyl arsonic acid,[8,10,11] *m*-phenylsulphonamide and *p*-phenyl sulphanomide (substituted or otherwise) groups and the last two have shown antimalarial activity when tested against avian malaria.[12]

Considering that a biguanide system is essential for activity in this type of antimalarials, in addition to the introduction of complex groups (as detailed above) it was thought worthwhile to study the simpler substituents at the either end of a biguanide link. Consequently various isomers and analogues of paludrine were prepared (*vide* table) where the effect of the chlorine atom in the different positions in the phenyl ring I-II, the effect of other halogen atoms and cyano group at the para position of the phenyl ring (IV-VII) and the effect of an extra chlorine atom in the p-chlorophenyl group (IX, X) have been studied. The work has been further extended in which the isopropyl group in N^1-2:4-Dichlorophenyl-N^5-isopropyl-biguanide (X) has been replaced by a number of branched chain alkyl groups derived mostly from the different alkyl amines previously reported[14] (XI –XIX).

Table A. N^1-Aryl-N^5-alkyl-biguanides.

X.NH-C-NH-CNH.R, HCl.
‖ ‖
NH NH

No.	X	R	m.p., °C.
I	*o*-Chlorophenyl	Isopropyl	230
II	*m*-Chlorophenyl	do	227–228
III	*p*-Chlorophenyl (paludrine)	do	241
IV	*p*-Fluorophenyl	do	226
V	*p* Bromophenyl	do	237-38
VI	*p*-Iodophenyl	do	234
VII	*p*-Cyanophenyl	do	231–32
VIII	β-Naphthyl	do	229–30
IX	3 : 4 Dichlorophenyl	do	236
X	2 : 4 Dichlorophenyl	do	240
XI	do	Methyl	215
XII	do	Dimethyl	231
XIII	do	2-Butyl	240
XIV	do	3-pentyl	221–22
XV	do	*iso*-Pentyl	216–17
XVI	do	β *iso*Hexyl	217
XVII	do	2-Pentyl	220–221
XVIII	do	Piperidyl	230–31 (Base 150)
XIX	do	2-Octyl	224

All these derivatives have been prepared by the interaction of the required arylcyanoguanidines[13] with the alkyl amines in presence of copper sulphate or with their hydrochlorides by fusion. All the biguanides were isolated as white crystalline hydrochlorides.

Full details will appear elsewhere.

Our thanks are due to Dr. B. H. Iyer for his keen and helpful interest in the work and to the Indian Research Fund Association for the award of a fellowship to one of us (H .L. Bami).

Organic Chemistry Laboratories, Indian Institute of Science, Bangalore, *September* 9, 1948.

H. L. BAMI.
P. C. GUHA.

1. Curd and Rose, *J. Chem. Soc.*, 1946, 729. 2. May, *J. Org. Chem.*, 1947, **12**, 437, 443. 3. Mosettig, *ibid.*, 864. 4. May *et al.*, *ibid.*, 869. 5. Gupta, Iyer, and Guha, *Current Science*, 1948, **17**, 53. 6. Gupta and Guha, *ibid*, 185. 7. Personal Communication. 8. Roy, Iyer and Guha, *Current Science.*, 1948, **17**, 126. 9. Bami, Iyer and Guha, *J. Indian Inst. Sci*, 1948, **30A**, 9. 10. *indem*, *ibid.*, 1947, **29A**, 16. 11. *indem.*, *ibid.*, 1948, **30A**, 1. 12. *indem.*, *Current Science.*, 1947, **16**, 386. 13. Bami, *J. Indian Inst. of Sci.*, 1948, **30A**, 16. 14. Bami, Iyer and Guha, *ibid.*, 1947, **29A**, 9.

A NOTE ON THE OCCURRENCE OF THE PORCELLANITE STAGE OF THE SEMRI SERIES OF LOWER VINDHYAN IN JODHPUR STATE

In his "Geological Notes on Great Indian Desert between Sind and Rajputana"[1] Blanford, calls one of the formations met with in his traverse as 'Shales and boulder bed of Lowo and Pokran"[2] and described these beds as consisting of "green, red and variously coloured shales, occasionally soft, but often hard and porcellanic. Some are fine, others are coarse and sandy, and contains grains of pink felspar and of a green mineral resembling epidote; some beds being composed throughout of one or the other of these minerals. In places, pebbles and boulders of the Malani porphyries and syenite are found towards the base of the shales; the boulders being occasionally from three to four feet in diameter while remains of much larger blocks, which had fallen to pieces but which could not have measured less originally than twelve to fifteen feet in diameter, were seen at Lowo. These boulders appear to have been brought from a distance, and there is some reason for supposing that they may have been transported by ice, as the underlying surface of the Malani porphyry near Pokran was in one instance found to be grooved and striated."[3].

Last year I had occasion to visit Lowo and Pokran first independently and again in the company of Sir Cyril Fox.

At Pokran, the rocks observed were sharply cross-bedded soft red sandstone overlying rhyolite either directly or through the intervention of an impersistent bed of conglomerates composed almost entirely of prolate spheres of rhyolite upto a foot in diameter.

The soft sandstone continue for about three miles E. SE. of Pokran on the way to Lowo, when exposures of rhyolite come in. About 5 miles from Pokran, the geology changes and rocks of a different nature appear. Fine-grained and porcellanic, the rocks range from chocolate to green in colour and rest directly on the rhyolite. Their best development is round Lowo, about 7 miles E. SE of Pokran and west of the salt lake where they outcrop in greater variety.

Pink and green, some are hard, porcellanite shale; others gritty containing grains of pink felspar embedded in an isotropic green material, resembling the porcellanite. Intercalations of thin papery purple shale and of bands of Fuller's earth are also seen, the latter being used for white-washing. North of the road the ground is strewn with pebbles of jasper. Thin bedded, the beds have low rolling dips.

The boulders of "Syenite" mentioned by Blanford have rolled from the neighbouring many low knolls of pink Siwana granite occurring about a thousand feet west of the salt lake. As is well known the Jalor and Siwana granites are the concluding phase of the Malani volcanic period. Exposures of Siwana granite are seen as far west as Sankra (Long. 71° 35′ 4″: Lat. 26° 44·29′) in Jodhpur State.

Except that we were both unable to trace any boulder bed here Blandford's description of the rocks near Pokran fits those here exposed.

The above beds answer to the description of rocks from the Lower Vindhyan, particularly from the Porcellanite stage, of the Son valley as described by Vredenburg[4] and Auden[5] rather than to any Talchir Boulder bed to which they have tacitly been supposed to belong. Sir Cyril thus confirmed, my earlier identification of the beds as belonging to the Porcellanite stage of the Semri Series.

These rocks have since been compared with those of the Porcellanite stage, Chopan, Mirzapur District U.P. obtained through the courtesy of the Geological Survey of India and have been found to be identical.

Another occurrence of the Porcellanite stage is in the low hillocks SW of Baorli (Long. 72° 43′ 51″: Lat. 26°21′48″ about 20 miles W.N.W. of Jodhpur City.

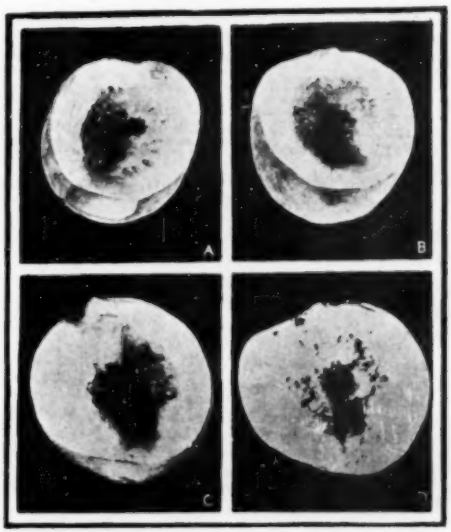
Dept. of Mines and Geology, Jodhpur, S. K. Borooah.
August 18, 1948.

1. *Records Geo. Survey India*, **10**, pt. 1. 2. *Supra* 17. 3. *Supra* 17 4. *Memoirs G.S.I.*, **31**, pt. 1 94. 5. *Memoirs G.S.I.*, **42**, pt. 2, 153–157.

INTERNAL BREAKDOWN OF GUAVA FRUIT (*PSIDIUM GUYAVA* L.)

Guava Fruits are known to suffer from very few diseases. Scrutiny of the available literature shows that there is only one disease reported from India[3] and three from abroad[1,3] and [4].

In the course of investigation of the wilt disease of guave tree[2], which is in progress in this laboratory, the author came across a guava fruit (Fig. 1 B) which was suffering



from a disease that has been termed internal breakdown. The particular fruit was quite fresh and healthy in its external appearance, and only when it was cut into two halves that the disease became apparent. Subsequently few more fruits were obtained from the Government Horticultural Gardens, Lucknow and Ghazipur orchard, Lucknow. A preliminary survey revealed that the disease was very rare.

In all the fruits, except two in which the disease had progressed considerably involving about 1/6th of the internal tissue (Fig. 1 C and D), the symptoms were more or less identical. The earliest symptom of the disease, which appears when the fruits are small, unripe and hard, is the slight browning of a few cells in the central region of the fruit. As the disease advances, more and healthy tissues get involved. Due to the death and disintegration of the diseased cells, an irregular cavity is formed (Fig. 1 A), which gradually increases in size. The tissue lining the cavity is dry, hard and brown in colour and the seeds lying in this area become dry and blackened. There is a gradual transition from the dark brown diseased tissue to the healthy tissue. The diseased tissue retains its dry and dark appearance even after the fruit is ripened and pulpy. So far as investigation goes, this internal breakdown does not have any visible effect on the exterior of the fruits which in all cases so far observed were very fresh and healthy.

Separate isolations were made from the different regions of the diseased tissue and the apparently healthy neighbouring cells of each of the fruits. Some of these tissues were also subjected to microscopic examination for possible presence of bacteria or fungi. The results showed that all the fruits so far examined except one were free from any pathogenic organism. It was evident that in all these cases the disease was a physiologic one similar to that known as internal breakdown.

One of the fruits in which the disease had progressed far, however, gave in culture, bacteria and two kinds of fungi (Alternaria and Fusarium). The inoculation experiments with these isolated organisms have failed to reproduce the disease, which shows that this was also a case of internal breakdown but with secondary infection. The full paper will appear elsewhere.

The author is grateful to Dr. S. N. Das Gupta for his kind guidance.

Department of Botany, J. N. RAI.
The University,
Lucknow,
August 30, 1948.

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A MOSAIC DISEASE OF *LAGENARIA VULGARIS* SER IN THE BOMBAY PROVINCE

IN August, 1939, typically mosaic mottled plants of *Lagenaria vulgaris* were observed on the Agricultural College Farm, Poona. Records of investigation on its transmission, physical properties and host range showed that the disease in *L. vulgaris* was caused by a virus not recorded previously. The disease is quite common on *L. vulgaris* in the province causing appreciable damage to the crop. This note deals with the observations made so far on the various aspects of the disease.

The first symptoms of the disease appear in the form of well defined green mosaic with light-green and deep-green patches intermixed, in about 10 to 14 days after sap inoculation of healthy seedlings of *L. vulgaris* (Fig. 1). In young leaves the discolouration

FIG. 1. A leaf of *Lagenaria Vulgaris* affected with the mosaic virus, showing typical mosaic symptoms

is quite distinct, but it gradually gets diffused as the leaf grows in size and age. Occasionally bright yellow or whitish chlorotic patches appear indiscriminately on the leaf lamina. Leaves are greatly reduced in size though not malformed. The diseased vines are thin, dwarfed and weak. Fruits set on diseased plants are usually small in size and less in weight as compared to those borne on the healthy plants, and often show severe discolouration in patches.

The virus is readily sap-transmissible and has been observed to be transmitted through seed in only two out of 824 plants raised in insect-proof glasshouse from commercial seed. In transmission tests with *Aphis malvae* Koch, which commonly breeds on *L. vulgaris* during summer, none of the 36 plants of *L. vulgaris* on which the aphid fed for 24 to 72 hours was diseased.

The virus.—The virus is stable in its physical properties. It stands heating for 10 minutes

at 95°C. but not at 98°C., retains infectivity at a dilution of one in a million and on storage for 308 days at laboratory temperature. It also withstands treatment with 95 per cent. ethyl alcohol for 24 hours and remains viable on desiccation.

Host range.—In addition to *L. vulgaris*, the virus readily infects *Cucumis sativus* L., *C melo* L., *Citrullus vulgaris* Sch., *C. fistulosus.* Stocks., *Luffa acutangula* Roxb. and *Trichosanthes anguina* L., *Cucurbita pepo* L. and *Momordica balsamina* L., though diseased, do not show visible symptoms and thus act as carriers of the virus.

Benincasa hispida Cogn., *Cucurbita moschata* Duch., *C. maxima* Duch., *Hibiscus esculentus* L., *Spinacia oleracea* L. and a number of species belonging to the families Solanaceae and Leguminosae could not be diseased when inoculated with the virus.

The mosaic disease in *L. vulgaris* dealt with in this note is caused by a virus quite distinct from the mosaic disease of bottle gourd described by Vasudeva and Lal.[1] On the other hand it closely resembles Ainsworth's cucumber green-mottle mosaic virus in respect of its host range restricted to Cucubitaceæ, inability to infect Solanaceous plants, and physical properties, but differs markedly in its ability to multiply in *Cucurbita pepo* which could not be infected with the green-mottle mosaic virus.[2] Accordingly, it is suggested that the mosaic virus of *L. vulgaris* be grouped with *Cucumis* virus 2 and designated as *Cucumis* virus 2 B according to the classification by Smith[3], and *Marmor astrictum* var. *lagenari* var. *nov.* according to the classification by Holmes.[4]

Further work on insect transmission is in progress.

Grateful thanks are due to Dr. B. N. Uppal for help and encouragement during the progress of the work. This investigation is being carried out under a scheme financed by the Indian Council of Agricultural Research.

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August, 14, 1948.

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SEX CONDITION IN INTERSPECIFIC CROSS, *LUFFA AEGYPTIACA* × *LUFFA ACUTANGULA*

Luffa ægyptiaca ($n = 13$), the smooth loofah and *Luffa acutangula* ($n = 13$), the angled loofah, are monœcious. The difference between the two species is, however, very great in the stage at which the pistillate flowers appear.

In L. ægyptiaca, the female flowers come up at a very early stage soon after the appearance of male buds, at about seventh to tenth node, and both male and female flowers open more or less simultaneously whereas in *L. acutangula* the female flowers appear at a very late stage after a long interval when the plant fully establishes itself and male flowers commence opening profusely for sometime. The difference between the two species is thus well marked, *i.e.*, early appearance of female flowers in *ægyptiaca* and late appearance of female flowers in *acutangula*.

Inheritance of this sex condition was studied in the interspecific cross between the two species which cross readily, particularly with *L. ægyptiaca* as female and the back crosses. Other characters were also studied in the cross, not recorded here. The sex conditions observed in the parents and the hybrids have been designated as follows, for easy expression. The symbols M and F indicate male and female flowers respectively.

(1) (M−F) Appearance of male and female flowers simultaneously at the same node, from the beginning, *i.e.*, appearance of female flower, earlier than in *ægyptiaca*.

(2) (M F) Early appearance of female flowers soon after the male ones (*ægyptiaca*).

(3) (M + F) Intermediate condition of the appearance of female flowers, *i.e.*, earlier than *acutangula* and later than *ægyptiaca*.

(4) (M + + F) Late appearance of female flowers (*acutangula*).

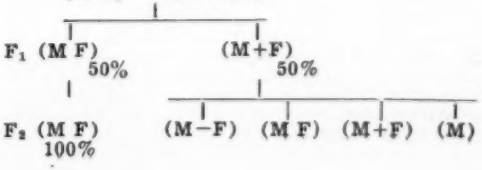
(5) (M + + + F) Very late appearance of female flowers which appear in a very limited number (Hybrids with such a condition produced compact inflorescence, bearing comparatively small, circular and sterile male buds, very few of which developed to produce open flowers).

(6) (M) No appearance of female flowers, *i.e.*, such individuals are only male plants.

(*a*) *L. ægyptiaca* (female) × *L. acutangula* (male).

The F_1 hybrids could be distinctly classified into two types, nearly in equal numbers, *viz.*, (M F) with smooth fruits and (M + F) with angled fruits (intermediate condition). The former produced nearly cent. per cent. fertile pollen, whereas the latter showed a high percentage of sterile (empty) pollen. The two types also differed from each other greatly in a number of other characters.

The progeny (M F) hybrids in F_2 produced the same sex condition with smooth fruit, whereas the (M + F) ones gave F_2 hybrids which differed greatly, showing (M−F), (M F), (M + F) and (M) conditions in varying numbers :—



The F_1 data indicate the type of segregation one would expect in a cross in which one of the parents would be heterozygous for sex.

(*b*) The cross was repeated, and again in F_1 two distinct types were observed in nearly equal numbers, *viz.*, (M + F) with angled fruits (intermediate) and (M + + + F) with smooth fruits. This time a new type (M + + + F) came up in place of (M F). It may be added that this new type looked nearly sterile and very much different from (M + F) individuals. Both of the types showed a high percentage of pollen sterility :

(M F) × (M+ +F)

F_1 (M+++F) 50% (M+F) 50%

This inconsistent behaviour observed in (*a*) and (*b*) might be due to different parent plants used of the same phenotypes.

(*c*) *Reciprocal cross.*

The cross, as a rule, is difficult to achieve, with *L. acutangula* as female. Only one crossed fruit was obtained after great efforts. All the F_1 hybrids showed only (M + F) condition with angled fruits (intermediate). A high percentage of pollen sterility was observed.

(*d*) *Back crosses* were attempted in experiment (*a*). F_1 (M + F) hybrids could not be crossed back with either of the parents, whereas F_1 (M F) ones crossed back easily. In both cases F_1 was used as female :—

(i) F_1 (M F) × P_1 (M F) *L. ægyptiaca* :

Two F_1 hybrids were used and in both of the back crosses the hybrids produced were all of (M F) type with smooth fruits.

(ii) F_1 (M F) × P_1 (M+ + F) *L. acutangula*:

The same two F_1 hybrids used in the above back cross were employed in this case as well with the same common male *acutangula* parent. Thus two back cross families were raised. In one of them the hybrids produced varied in their sex conditions as shown below in various proportion.

(1) (M F) with smooth fruits.
(2) (M + F) with angled fruits (Intermediate).
(3) (M+ + + F) with smooth fruits.

The (M + + + F) ones resembled in appearance the (M + + + F) individuals, referred to above, under (*b*) very closely :

F_1 (M F) × P_1 (M++F)

(M F) 50% (M+F) 25% (M+++F) 25%

Whereas in the other back cross family, only Nos. (1) & (2) appeared in nearly 75% and 25% respectively.

The details of these investigations with inferences and the cytological studies which have been in progress will appear elsewhere in due course.

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INTERNATIONAL CONFERENCE ON STANDARDISATION

DR. LAL C. VERMAN, Director, Indian Standards Institution, has returned from a three month tour in Europe, U.S.A. and Canada, where he attended a number of International Conferences and visited Standards Organisations in different countries.

At the Council Meeting of the International Organisation for Standardization (ISO) at Geneva, Dr. Verman represented India for the first time. A number of organisational problems concerned with the ISO were considered at this meeting and a Sub-Committee consisting of 5 nations including India was appointed to make recommendations concerning the constitution of the ISO. Rules of Procedure for international standardisation were also adopted for the guidance of various national standards bodies.

The ISO Technical Committee on Textiles met at Buxton, England, at which India was represented through a delegation consisting of Mr. Bharat Ram, Mr. B. M. Bagri, Mr. G. E. Longdin, Dr. Lal C. Verman and Mr. C. P. Halkatti.

International recommendations for methods of testing textiles represented one of the major items considered at this Conference. The proposal of the Indian Delegation for the adoption of a distinct Standard Atmosphere for textile-testing in tropical and sub-tropical countries was accepted as an International Recommendation.

The ISO Technical Committee on Documentation met at the Hague, Holland, towards the latter part of June, at which India was represented by a delegation consisting of Prof. S. R. Ranganathan (Leader), Mr. N. D. Gulhati, Secretary, Central Board of Irrigation, and Dr. Lal C. Verman. The Indian Delegation made important contributions to the deliberations of this Conference which related to a number of different aspects of standardisation on Documentation.

Dr. Verman made a particular study of the British Standards Institution, Canadian Standards Association and the American Standards Association. He also visited a number of research and testing laboratories and contacted organisations closely associated with standardisation activities in the various countries, such as for instance, the American Society for Testing Materials. Society of Automotive Engineers, American Petroleum Institute, etc.

The Indian Standards Institution having agreed to provide secretariats for International Committees on Mica and Shellac, Dr. Verman took this opportunity to contact British and American Committees dealing with these subjects. As a result of discussions held with these Committees and other interests concerned with the utilisation of Shellac and Mica in different industries, it is expected that the international work on standardisation in these fields will be greatly expedited.

REVIEWS

Cottonseed and Cottonseed Products—Their Chemistry and Chemical Technology. Edited by Alton E. Bailey. Pp. xxiii + 936. (Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N.Y.), 1948. $ 17·50.

The book under review is a comprehensive treatise on all the aspects of cottonseed and is the outcome of the collaboration of twenty-five specialists. In the U.S.A., cottonseed was considered a useless material and even a nuisance in the early part of the 19th century. By the end of that century, however, this troublesome waste product was converted into one of the major cash crops of the States, especially the Southern U. S. Beginning from this century up to date, there has been further rapid progress in the scientific knowledge and technical processing of this oil seed. This treatise, therefore, gives "a broad treatment of the scientific principles underlying a great American Industry—an industry which is in fact a child of applied science" (page v).

There are five sections comprising twenty-five chapters in all. The first five chapters relate the story of the growth of cottonseed industry in the U.S.A. as well as in other cottonseed producing countries from the earliest times and thus give a comprehensive and comparative picture. This is followed by a detailed account of the structure of cottonseed, its various components, its biology and the chemistry of its pigments, proteins and other constituents. Methods of sampling, grading and evaluation of all the products have been traced from their early developments to the present day rational practices based on rigorous inspection, sampling and exact analysis. The next few chapters describe methods of processing cottonseed to obtain lint, hulls, oil and cake from it. The economics of cottonseed crushing is also discussed. The last section gives technical methods of transforming the edible and inedible products of the seed into usable commodities.

This is probably the first attempt to write an exhaustive treatise on a single oil seed. Naturally, in trying to be exhaustive, a part of the subject-matter has been repeated more than one time. Sometimes, the treatment has tended to be too elementary. Some chapters deal with the main subject only incidentally. Thus, the chapter "Nutritional Aspects of Cottonseed Oil" really discusses the "Role of Fat in Human Nutrition", as in fact is indicated by the sub-title of that chapter and therefore may belong to a book on nutrition or biochemistry. All of these, of course, are not errors of judgment, but are perhaps unavoidable features of a treatise. As remarked by the editor, the treatise "may (and will) profit a somewhat larger circle of readers than the average volume of science or technology". Many chapters may be read independently. As an illustration, the chapter on pigments of cottonseed will be found to be highly informative to the organic chemist and especially the colour chemist. In fact, the protein chemist, the nutritionist, the biologist, the cattle feed specialist and the oil-miller, each one will find something interesting in the relative chapters. The treatise is therefore strongly recommended as a worthy reference book on cottonseed.

Coming nearer home, it is a painful reflection that India, although it ranks second in cottonseed production, has no cottonseed industry worth the name. Some solace may be derived from the knowledge that "the first record of the crushing of cottonseed to obtain oil or cake apparently dates back to the early Hindu writings" (p. 5), and that "As far back as about 300 B.C. a crude type of gin originated in India employing rollers which, when rotated close together, would pull the lint back between the rollers and leave the seed behind" (p. 10). However, at present, "among the major cotton-producing nations, India appears to be the only country where the bulk of the cottonseed is neither crushed domestically nor exported" (p. 53). The largest percentage is fed whole—lint included—to the cattle. It is hoped that this treatise at least will awaken the Indian oil-technologists and industrialists to a more rational use of this immense agricultural wealth.

Considering the size of the book, only a very few minor mistakes and misprints have crept in. Some of them are "Verda" for "Vedas" (p. 4, para 3, line 5), "principle" for "principal" (p. 105, para 1, line 5 and p. 183, para 3, line 7), "proceeding" for "preceding" (p. 183, para 3, line 3), "make up and bulk" for "make up the bulk" (p. 480, last para, line 2), "corkscrew-type" for "corkscrew-type trier" (p. 574, item 7 under D) and "Cis" for "trans" (p. 769, para 2, line 6).

The printing, the illustrations and curves have been neatly executed. The authors and the publishers are to be complimented on this welcome addition to the series of monographs on Oils and Fats.

J. G. KANE.

"Textile Science". By J. T. Marsh. (Chapman & Hall, Ltd., London, 1948.) Pp. xii + 388. Price 32 *sh.* nett.

Textile Processing is rapidly developing into a science and from this point of view, the title of the present book appears to be very appropriate. The book is full of valuable information, so many facts being condensed under one cover. From this point of view, it may be considered a valuable addition to the existing literature on the subject. From the reviewer's point of view, the book offers many difficulties. It is extremely difficult to decide as to which class of readers the book is directed to. We are told by the author that it is addressed to those with some education in science and who are training for a career in the textile industry. The book certainly cannot be followed by an uninitiated beginner. In parts, it is too elementary for the professional student. It is not

at all an easy matter to give views on the success with which the author has satisfied the needs particularly of those to whom he has addressed it.

The book is divided into four parts. Part I deals with the chemical constitution, molecular structure and physical and chemical properties of fibres. Part II is devoted to the mechanical processing of fibres, particularly their conversion into yarns and fabrics. The whole subject of spinning and weaving is condensed in only 34 pages. Part III deals with bleaching, dyeing and printing and Part IV with finishing.

A number of misprints occur in the text. For example, on page 49, line 27, wood for wool, on page 92 the expression: Physical properties of textile fibres *varies* with their moisture content. On page 216, potassium chromate is expressed as $K_2Cr_2O_4$, while on the same page, potassium perborate is expressed as $NaBO_3$ $4H_2O$. Several statements are either incorrect or not quite clear. The following few are given as illustrations. On page 243, line 13 "Anthraquinonoid colours *usually* give a deep blue vat", or on page 244, line 25 ".....This is effected in the second stage of the dyeing process by sulphuric acid and sodium nitrite to give nitrous acid" or line 39 on the same page ".....The reaction depends on the fact that suitable amines may be converted into diazo compounds by treatment with nitrous acid". Similarly, on page 379, line 19. "Chromium and iron can be applied by the impregnation with chrome alum followed by precipitation with sodium or potassium chromate". Many more can be added to this list. It is hoped that in the second edition of the book, all these will be attended to.

The book is well got up. The facts in the text are supported by many graphs and also a number of sketches of machines mentioned are included. It may be found very useful as a ready reference book giving useful information on almost all branches of Textile Technology.

G. M. NABAR.

Radio Receivers and Transmitters. By S. W. Amos and F. W. Kellaway. (Chapman & Hall, Ltd., London), 1948. Pp. xii + 356, 25 *s.*

We are witnessing the establishment and growth of a number of Polytechnics in India at the present period. The book under review should, therefore, find a ready welcome among the Radio Technology students of these institutions especially as the functions of the several sections and components of receivers and transmitters have been described and analysed with the aid of relevant mathematical formulæ. The subject of transmitters has naturally not received that detailed attention that has been paid to receivers. The highest frequency considered suitable for communication by Radio is taken to be in the neighbourhood of 45 megacycles per second. Television, too, finds a place in the book in the role of an important application of the principles of Radio transmitters and receivers.

The book opens with an introductory chapter that gives the reader a bird's eye view of its scope and contents. The next three chapters deal with the Inductance, Capacitance and Resonant and Coupled Circuits. The fifth chapter on the Propagation of Radio Waves and Aerials is the sketchiest and shortest chapter—under 20 pages—of the book. To give one instance, the topic of inverted V and rhombic aerials has been dismissed with a paragraph of less than 20 lines. The value of the book would have been considerably enhanced if this chapter had also been planned on the lines of the others. The three chapters that follow fully cover AF amplification, Detection; the Output Stage, the Loudspeaker, the Negative Feed back; RF amplification, Straight Receivers and IF amplification. The ninth chapter on Oscillators, Superheterodyne Receivers for AM, FM and Television contains a complete circuit diagram and a lucid analysis of a good commercial superheterodyne receiver, in addition to sections on other topics elucidated with equal clarity. The book concludes with a chapter of about 40 pages on Transmitters for Telegraphy, AM and FM broadcasts and Television. This is the only chapter without a bibliography. Seven short mathematical appendices and an index are also included.

In keeping with the authors' intention that the book is to be a bridge joining pure science and applied radio, no attempt has been made to derive all the mathematical formulæ used. On the other hand, the most commendable feature of the work is that there is hardly any formula in it whose significance has not been driven home with the help of worked examples in which representative numerical values have been substituted for the symbols. The practical student has to be grateful to the authors for the careful attention they have paid to this aspect of the subject. One of the few exceptions to this rule however occurs in the section on loudspeakers (p. 202) wherein the values of B in the air gap, the length of wire in the speech coil, etc., have not been given. Readers would also appreciate the actual decibels referred to a defined zero decibel marked against the Y-axis of the "Response curve of High grade Loudspeakers" (Fig. 132).

A somewhat serious misprint has crept in on p. 248 in connection with the equation for the Shot fluctuation voltage in a thermionic vacuum tube where I is stated to represent 'the anode current at any instant of time (R.M.S.)' while it ought to be the R.M.S. value of the random electronic current.

The bibliographies at the end of every chapter are worthy of note in two respects—one is that only important and relevant titles are referred to and the other is that the vast majority of them are British in origin. Scientists, writers of books on Science inclusive, claim science to be international and this latter, insular tendency is therefore certainly to be deplored. That a good number of American books, especially on Radio and allied subjects, similarly list references mostly to papers of American origin should not be regarded as a justification for others to adopt the same policy.

The book is neatly got up and is adequately illustrated with figures and plates. Its merits

outweigh the one or two defects commented on here and one can unhesitatingly recommend it for use by the class of readers for whom it is intended though it is priced rather high even for these days of soaring costs of production.

R. L. N.

Power System Stability. Vol. I. Elements of Stability Calculations. By Edward W. Kimbark. (John Wiley & Sons, Inc. New York), 1948. Pp. viii + 355. Price $ 6·00.

These are days of Grid systems. Small isolated power stations working at high cost, low efficiency and incapable of meeting peak-load demands, may be and are being harnessed to better and more economical use by interconnecting such stations with other power stations forming a grid system. But this system of interconnection has brought in its wake very intricate and difficult problems of maintaining such a system with proper stability.

With such serious problems before them, electrical engineers naturally welcome any publication that might help them in their work. And when such an one comes from an author who was very closely associated with this type of work it is certain to be studied with great interest.

The book under review is only the first of the three volumes devoted to the study of Power System Stability, and it deals with the elements of stability calculations.

The first chapter states what actually is the stability problem and it has been explained by means of mechanical analogues. The second chapter deals with the swing equation and its solution. Swing curves have been drawn both from the formal solution of the equations and also from point by point calculation. The third chapter relates to the solution of networks. The method of reducing a network consisting of generators, transformers, transmission lines and loads, etc., to a simple circuit with impedances in series and parallel is given. Also in this chapter are described the General Electric A.C. Board and the Westinghouse A.C. Board, as well as the procedure in using the calculating boards. In the fourth chapter, the graphical method known as the 'equal area criterion' for determining if the system is stable under certain fault conditions is dealt with. Chapters V and VI deal with the fault-clearing time, determination of its critical value, factors affecting stability, and the solution of faulted networks.

The last chapter has very largely enhanced the usefulness and interest of the book by giving us four typical studies on stability. In each of these stability studies, the system and the contemplated changes are described and then the study to determine the factors causing instability of operation of the changed system and methods adopted to improve the stability have been exhaustively given.

The book is most welcome at the present time and is very worthy of a place in every electrical engineer's library.

B. N. N.

Annual Review of Physiology—Vol. X, 1948. (Published by the Annual Reviews Inc. and American Physiological Society.) Pp. xii+552. Price $ 6·00.

The Annual Review of Physiology aims at presenting topics in the form of reviews by scientists of highest rank throughout the world, although it is regretted that the present issue has achieved international authorship only in small degree. The volume is a record of the latest advances in several branches of Physiology and contains interesting series of articles on different subjects. A perusal of the contents show that the articles in this volume are written by well-known specialists. The authors have mostly confined themselves to literature survey during 1946-47, and have in accordance with the policy of the Editorial Board provided critical and integrated reviews of the subjects covered by them. In the article on 'Physical Properties of Protoplasm' Schmidt and Denues, lay special emphasis on several promising trends, particularly the application of information from precise physical investigations of model systems and the interpretation of observable physical properties of protoplasmic systems in terms of their molecular structure. The advances in genetics during recent years have been phenomenal and Beadle in his article on 'Physiological Aspects of Genetics' has chosen for special consideration several topics in physiological or chemical genetics. The chapter on Developmental Physiology is devoted to a discussion of the processes of development mainly from the biochemical point of view. The physiology of reproduction is the subject of an extremely interesting review by Reynolds.

The topics discussed in the volume cover, in addition to the familar subjects, a few new aspects of physiology: "Anoxia in Aviation" and 'Physiological Effects of Radiant Energy' represent two such topics. The problems of anoxic-anoxia and the relations of these problems to avitation had been studied during the War, but many questions of both practical and theoretical values remain unanswered. Such questions are of obvious importance to civilian avitation. Leslie F. Nims has critically examined these questions in the chapter on 'Anoxia in Avitation'. With the development of the atomic energy programme considerable impetus has been given to a study of the physiological effect of radiation and methods which might prove effective in preventing and treating the pathological changes induced by radiation. Dobson and Lawrence have attempted to bring out the highlights of recent development in this field in a highly suggestive chapter.

The volume is generously documented with references to literature. These reviews have become indispensable to a wide circle of investigators in the field of physiology and constitute an indispensable part of all Libraries interested in researches in their fundamental and applied aspects.

N. N. De.

Hæmorrhage. By Gregory Shawartzman and others. *Annals of the New York Academy of Sciences.* Volume XLIX, Art. 4, Pages 483-660. New York, 1948. Price $ 3·00.

This volume contains an interesting series of articles on hæmorrhage, and gives a critical evaluation and work-in-progress by eminent hæmatologists. It is valuable not only as a record of knowledge and accomplishment in this particular branch, but also as an incitement to research. As has been stated in the introductory remarks, certain pertinent investigations could not be covered in the volume, due to unforeseen circumstances; and the omission of such problems as erythroblastosis, cerebral hæmorrhage, and regeneration of the formed elements of blood and plasma following bleeding, are due to the fact that certain aspects have already been discussed at preceding conferences.

John H. Ferguson has given a masterly review of some basic facts of blood coagulation. Summarising the reaction of blood clotting and the rôle of calcium in clotting reactions and of phospholipid and thrombo-plastin in thrombin formation, the author gives reference of an unrecognised clotting factor, which is considered an important accessory factor in the conversion of prothrombin to thrombin. C. H. Best and L. B. Jaques in the discussion of "Heparin in blood clotting and thrombosis" have tried to throw some light on how to attack this problem. The relationship of vitamin K to hæmorrhage and coagulation has been discussed by S. A. Thayer. Discussing on the hæmorrhagic manifestation observed in experimental deficiency of pantothenic acid, choline and cystine, Paul György concludes that the syndrome in experimental deficiency of pantothenic acid in rats is due mainly to an underlying general blood dyscrasia, while the manifestations occurring in experimental deficiency of choline and in related conditions are caused probably by direct damage of the organs involved, especially the kidney and liver. There are valuable surveys, complete in themselves and covering very wide grounds on "The effect of hæmorrhage on circulation" by Dickinson W. Richard Jr., on "Experimental studies on traumatic and hæmorrhagic shock" by Magnus I. Gregersen and on "Vasomotion in Haemodynamics of the blood circulation" by Robert Chambers. The papers on "Reaction of peripheral blood vessels in Experimental Hæmorrhage" by Zweifach, Chambers, Lee and Hyman, "Metabolic changes associated with hæmorrhage" by Wilhelmi and Long and "Certain Anatomo-pathologic aspects of Hæmorrhage" by Klemperer are of the nature of survey of recent advances. Van Slyke discusses "the effects of hæmorrhage on the kidney" and points out that the relations between the central blood pressure, renal blood flow and glomerular filtration in shock caused by muscle trauma were similar to the relations noted in shock caused by hæmorrhage. The other articles deal with "hepato-renal factors in circulatory homeostasis," "hæmorrhagic manifestations of bacterial and virus infections" and "abnormal hæmorrhage with normal platelet count and normal clotting". "Clinical aspects of hypoprothrombinæmia" has been reviewed by Davidson and Tagnon. With the unfolding of our knowledge of the physiology of blood prothrombin and its relation to vitamin K, a better understanding has arisen of the disease associated with hypoprothrombinæmia, their diagnosis and treatment.

The editor as well as the contributors deserve the thanks of physiologist, biochemist and medical men for providing such a readable and informative volume. It will prove indispensable to all who are keen on the recent advances in the field.

N. N. Dz.

College Zoology. By R. W. Hegner. 5th Edition. (Publishers: The MacMillan Co., New York), 1947. Pp. xvii + 817., Price 25 *sh.* net.

R. W. Hegner is a well-known American author. The present edition of his *College Zoology* is an improvement on the previous one. Most of the chapters are re-written and a number of chapters on general principles are added. The author has made an attempt to convey to the student through this text-book a comprehensive picture of the subject as a whole. The author has incorporated modern views developed in zoological sciences in the recent years. The newer aspects of biology such as animal physiology and animal behaviour are brought in. The student is also made to understand man's place in nature.

Type method is followed as it is considered the best teaching device in animal study. Classification of each phylum is briefly given up to orders. As is characteristic of the author the leading characters of the various groups are emphasised in the form of numerical points. The anatomy is dealt with briefly. The black and white pictures are large, clear and numerous. The coloured plates are a great asset to the book. A naturalistic interest is created by a description of the habits of animals and the profuse illustrations showing animals in their natural surroundings. The closing chapter on the history of zoology and the pictures of eminent biologists published therein are fitting in their purpose. As an introductory text-book to the various aspects of zoology it is invaluable. That a fifth edition has been called for within five years of its first publication is sufficient commentary on the excellence and utility of the book.

General Bacteriology. By D. B. Swingle, revised by William G. Walter. 2nd Edition. (Publishers: D. Van Nostrand Company, Inc., New York; Macmillan & Co., Ltd., London, 1947,) Pp. 311. Price $ 3·50.

The present volume is a revised edition in General Bacteriology which first appeared in 1940. The revised edition is the work of William G. Walter, Associate Professor of Bacteriology at State College, Montana. In conformity with the objects outlined in the first edition "to produce a book that will give the student a wealth of information in a form that is within his comprehension", the present revised volume by Walter amply justifies the hopes raised in the first edition.

A general outline of the book reveals that the scope of the book is enlarged to fit in allied subjects such as trends in antibiotics, disinfection and sulfonamides. The book is divided into 24 chapters, dealing with the early history of Bacteriology and passing through chapters on classification, culturing and nutrition of bacteria. There are independent chapters devoted to each of a large number of subjects such as Bacteria in soil, water, sewage, oil, milk, and foods.

The closing chapters of the book are largely devoted to mechanism of infection, Immunity Reactions and Pathogenic Bacteria finally ending with the last chapter on Viruses and the Bacteriophage. The author is to be congratulated for the wide range of subjects he has covered in such short space with clarity and brevity. The book will be a very useful addition to every student who wants to begin the study of Bacteriology.

T. N. R.

Five Hundred Varieties of Herbage and Fodder Plants, being Bulletin No. 39 of the Commonwealth Bureau of Pastures and Field Crops, Aberystwyth, Great Britain and edited by M. Hall, 1948. Pp. 328. Price 15 *sh.*

This Bulletin comprises a list of 500 plants which furnish fodder in one form or another and summarises information received about them from correspondents in different parts of the world. The information is brought together under definite heads, *viz.*, Origin, authority, characteristics, adaptation, resistance, use, certified or not, grades recognised, authority for certification, and if available in open market. The information relates to Australia, Canada, Finland, Great Britain, Netherlands, India, New Zealand, Norway, Palestine, Sweden, South and East Africa, and Trinidad. Notable and obvious omissions are Soviet Russia, the U.S.A., South America and Denmark. The list is intended only as a first attempt and is expected to be added to from time to time. Some hints on the cultivation side will enhance the usefulness of the book, such as soils suited, seed rate and method of sowing, whether fit for grazing, hay making and ensilage, number of cuts and yield of green fodder or hay, etc., in the same way as a list of the fodder crops of Brazil is being published by the Department of Agrostology of that country, and we suggest this addition in a later edition. The list includes a large variety of fodder crops, grasses, roots, many of the grain crops, leguminous fodder crops and so on, and may in that respect be said to be comprehensive. Some of the fodder grasses and crops of India also receive attention among which we notice, the fodder jowar varieties, *Cynodon dactylon, Cenchrus ciliaris, Dolichos lablab, Eleusine* spp. and others. *Carthamus tinctorius* is also included which is too spiny and repellent as cattle feed and is indeed grown in the margins of other crops in order to keep cattle away; it is however stated to be used for ensilage while the seed of course yields both oil and a well-known edible oil-cake. The contents of many of good Indian lists of fodder and other grasses like Prof. Rangachari's for South India, Prof. R. G. D. Graham's for Nagpur, Symond's 'Indian Grasses', and the lists compiled in the grass surveys of some of the Provinces recently deserve to be summarised in this way and we suggest this work to the departments of Agriculture in India. The Bulletin under review is a useful contribution to the literature on fodder grasses and crops.

A. K. Y.

Soil and Water Conservation in the Punjab. By R. Maclagan Gorrie. 1946. Pp. 290. Price Rs. 5. (Place of printing or publishers is not mentioned.)

In recent years a good deal has been written and said on the subject of soil and water conservation in India. Most of it describes more of experience elsewhere than of experience in India. The publication, under review, by Dr. Maclagan Gorrie of the Indian Forest Service, makes a departure in this respect and describes in detail, the practical field operations, under Dr. Gorrie's supervision, on soil and water conservation in the Punjab. Although the publication deals with a specific problem in the Punjab, the details of field operations will be of instructional value to those engaged on similar work in other parts of India.

Soil erosion is a universal and natural phenomenon, which is as old as the earth itself. It is brought about by rain and wind. Of primary importance, because of its gigantic scale, is that brought about by the flow of natural rainfall. The configuration of the surface of the earth today, with its large meandering rivers, fertile plains and deltas is the result of rainfall and erosion through geological time. As gigantic tectonic forces convulse and heap up large masses of land into mountains, rainfall erodes them into plateaus and valleys carving out rivers and forming extensive plains and deltas, which support huge populations of men and animals. The vast Indo-Gangetic plain and the extensive deltas with their teeming populations, are the children of soil erosion.

Vegetation slows down erosion and ultimately brings about a stage at which the natural processes of water regimen and soil erosion are stabilised. The interference by man and his animals for cultivation, upsets this balance of nature and this is followed by accelerated soil erosion and greatly disturbed water regimen. Cultivation is necessary for man to live. Man must, therefore, destroy forests and vegetation and reclaim land and thus upset the geological equilibrium. All this is a necessary and unavoidable evil which man must inflict. But the evil can be minimised and partly repaired with the aid of science and common sense. Afforestation and encouragement of vegetation do not entirely stop soil erosion. It goes on but only on a moderate scale. It controls, if not altogether prevent, the loss of good fertile soil—a loss to the individual who has been endeavouring to make a living from agriculture and in the aggregate a gigantic loss to the nation.

It was in the U.S.A. that the cry against erosion was first loudly raised two or three decades ago, and a huge organisation has been set up to fight soil erosion. Other countries soon took up the cry and today every country is "erosion minded" with varying degrees of action and talk. It should be noted that although Britain is the pioneer in the field of agricultural science and in the application of science to land management and crop production with impressive results, that country did not in the past lay emphasis on soil erosion. Nor does Britain even today take steps on a scale comparable with that in the U.S A. or Australia.

It is not because that soil erosion does not occur in Britain. It is largely because that in Britain the natural forces of erosion and systems and practices of agriculture had attained a balance several centuries before the U.S.A. or Australia or Africa began systematic exploitation of land. Agriculture, as we understand it today, began in these countries only two or three centuries ago by clearing forests and exploiting the virgin highly fertile soil. The accumulated fertility of ages began to be washed away and the introduction of modern methods of agriculture, intensively and extensively after World War I, accelerated erosion with disastrous results. Several farmers have had to abandon what were once fertile farms and to seek new land. This is "shifting agriculture" under modern conditions and does not materially differ from that of the primitive. This rapid loss in a few decades of what is accumulated through ages is the cause of the justifiable cry in the new countries. This is of significance to India and to the appraisal of Dr. Gorrie's publication under review.

In India, land exploitation and agriculture are of great antiquity. The adjustment of, and the balance between natural conditions and the agricultural systems attained a reasonable state of equilibrium long ago. Conditions of rainfall are such that precipitation is limited to a short period, and the result is, more often than not, drought or delugue in some large section of the country, so much so, that Indian budgets have the notoriety of gamble with monsoon. The fact that rice cultivation occupies by far the largest proportion of arable land is significant. Even more significant are the tanks for storing water, and the rice fields and their methods of cultivation which, under the circumstances are the most efficient methods, of conservation and utilisation not only of water delivered without notice and in unpredictable quantities but also in retaining lower down, the soil and silt eroded above, and preventing it from going into the sea. This is eloquent testimony to the understanding and controlling and conserving water and soil through several centuries by generations of farmers.

The significance of this seemingly commonplace and unimportant observation is that as Dr. Gorrie and many others consider, the water and soil conservation problems, of India cannot be solved only by the obvious method of dealing with the problems at the source without examining the repercussions in the established order of things lower down. India has to deal with the ills of ages. She cannot with impunity apply the *ad hoc* remedies found suitable for the young and expanding land utilisation and agriculture in newly colonised countries. It must be a process from part to the whole towards the top. The geological balance as such and in relation with the locally established agriculture and practices, should be investigated in the different catchment and agricultural areas of the country, paying regard to the contribution to acceleration or check made by good, bad, and indifferent farmers in the locality.

As has been stated already Dr. Maclagan Gorrie's book deals more with a specific problem under certain conditions than with a complete programme. Its chief merit lies in the detailed description of the practical aspects of the work with facts and figures. These will be found instructive and valuable to those who have to deal with soil and water conservation in India and Greater India.

B. V. N.

PROCEEDINGS OF THE ZOOLOGICAL SOCIETY OF BENGAL

THE *Proceedings of the Zoological Society of Bengal* is a new biannual Journal of Zoology published from Calcutta. The first number (March 1948, Rs. 10 or 10 sh.) which we have received contains eight original papers, mostly from the Zoological Department of the Calcutta University. Two papers deal with meiosis in the Acridiidæ. The other subjects covered include development of scales in *Glossobius*, bionomics and development of *Ophiocephalus striatus* and myxospordians from fishes. Mukerji and Mitra report the results of their experiments on the control of the termite *Odontotermes redemanni* giving the strengths of successfully used insecticides and conclude that the best results could be obtained in Bengal and Bihar if the insecticides are applied during the February-April period especially to reduce the immature reproductive forms which usually appear in March. Mookerjee and Bhattacharya give an account of the development of the Vertebral column in *Alligator mississippiensis* in continuation of Mookerjee's former work on the formation of the vertebra in other reptiles and batrachia.

The Journal is neatly printed and well produced and the illustrations are of a high order. Even though there are many journals in India devoted to Zoology and Natural History, increased output of work from Universties and Institutes has created the need for new avenues of publication. While welcoming this new Journal we hope the standard of publication will not be allowed to slide down, but effectively maintained and we wish this Journal a successful and un-interrupted career devoted to the cause of Zoology in India.

SCIENCE NOTES AND NEWS

Olympic Torch

This year it is Great Britain's turn to stage the Olympic Games and among the many problems for an event of such world-wide interest and importance, was the design of a torch to be carried by relays of runners across Europe from the plain of Olympia to Wembley Stadium in London.

In December 1946 the Fuel Research Organisation of the D. S. I. R. was approached by E. J. Holt, Esq., O.B.E., of the Organising Committee of the XIVth Olympiad for assistance and advice on the design of a torch and on the most suitable fuel. It was essential that the torch should be of light weight as it had to be carried for about 15 minutes by each runner (about 1,600 runners would be required on the route across Europe), and the torch would require to be so constructed that the fuel would burn under the most difficult weather conditions. The fuel employed had to be easy to ignite, while at the same time involving no high fire risk, as the torches would have to be transported and stored at numerous places on the route some time before the commencement of the run. It was also necessary, to ensure that each new torch could be lit easily and with certainty from a preceding torch; it was also desired that the fuel should give a visible but not very smoky flame.

This problem was undertaken by the Fuel Research Station and the actual investigation was carried out by Dr. L. R. B. Shackleton. Many different types of fuel were examined in torches of various designs made up from sheet metal. Finally it was decided that the most suitable fuel was hexamine in the form of tablets. Hexamine gives a non-luminous flame, and to make the flame visible in all weathers 6 per cent. of naphthalene was added.

Prototype torches made at the Fuel Research Station were tried out by runners, first from the South London Harriers and, after certain modifications in design, by Officers from the Royal Naval College, Greenwich. The requirements of the Organising Committee were fulfilled in final trials at Greenwich, and the prototype torch was submitted to Commander F. W. Collins, R. N. (Retd.) who was responsible for the arrangements for the manufacture and distribution of the torches, and for the run across Europe.

In the final design of the torch seven tablets were enclosed in a perforated metal cylinder with an inner sleeve concealing the lower three tablets. As the upper tablets burned away, the lower reserves were forced up into the burning zone by a spring. In order to facilitate lighting, the Wessex Aircraft Engineering Co., Ltd., Salisbury, provided a tablet of nitrate composition which was introduced on top of the fuel pack. A quick-match, provided for ignition, protruded through the perforated container.

One or two final refinements were introduced at the concluding stages to safeguard the effectiveness of the torches during transport to the various countries through which the relay runners had to pass. The fuel tablets were totally enclosed in a nitro-cellulose cover provided by Cascelloid Ltd., High Holborn, London. This cover burned immediately on ignition leaving no carbon residue. The perforated metal fuel container was also capped and sealed with adhesive tape. Both of these precautions were considered necessary to preserve the fuel and to avoid any risks of accidental ignition.

Oil Position in India

The oil position in India has been examined by Dr. D. N. Wadia, Director, Indian Bureau of Mines in an article in the latest issue of *Indian Minerals*.

After discussing the history of the oil industry in India and the prospects of the various oil-fields, the author observes:—

"Oil exploration in India is yet at an early stage, fitful and defective, although it began in 1800 in Arakan, in 1820 in Burma and in 1870 in the Punjab; but the history of oil exploration in India is one long record of failures and disappointments. In proportion to millions of rupees spent in India for search, discovery of new oil-fields has been very costly and slow. Oil exploration and development is an extremely expensive and risky enterprise, beyond the means of any but powerful Corporation with large and widespread resources in capital and technical knowledge. But intensive geological exploration supplemented by geophysical prospecting, notably by seismographic reflection and refraction methods and by gravity determination by the Torsion balance and the more modern gravity measuring instruments remains to be done in many areas. Till this is accomplished, it is not possible to form any correct estimate of India's petroleum resources."

Synthetic Mica

According to Dr. Lal C. Verman, Director, ISI., who has just returned from a study tour of the Continent and the U.S.A., manufacturers of electrical machinery are now making use of silicone-bonded glass cloth in place of mica. More important still is the fabrication by a Swiss technologist of "Mica Powder Film", a composition made from cheap mica powder. A factory is reported to be planned for producing "Mica Powder Film" on a large scale. When commercially available, this mica-substitute, it is said, can successfully compete with natural mica in the manufacture of electrical tape.

Another recent development is that of synthetic mica, which is the subject of intensive experiments by the U. S. Army and Navy. The process which requires only cheap raw materials, is reported to have reached the stage of pilot plant experimentation. If successful, this process will be capable of producing mica crystals of sufficiently large dimensions to compete with the natural product.

American users of mica have complained that they are being forced to look for substitutes for mica largely because of the uncertainity of quality and lack of uniformity of supplies of the mica imported from India. The manufacturers of electrical goods feel that export from India of mica of acceptable standards of quality and sizes would help to maintain the present large and persistent demand for this valuable mineral.

The average annual export of mica from India is 11,250 tons valued at Rs. 217 lakhs, most of which represents hard currency (U.S. dollars).

The International Organisation for Standardisation (ISO.) has entrusted the Indian Standards Institution with the secretariat of an International Committee to develop internationally agreed Standards on Mica. Foreign countries, which are large importers of mica, have offered full co-operation in drawing up standard specifications. Strict conformity to standards is bound to put this important Indian mineral industry on a sound and scientific basis.

The Geological, Mining and Metallurgical Society of India

The 24th Annual General Meeting of the Council of the Geological, Mining and Metallurgical Society of India was held on 10th September 1948 at Calcutta when Dr. S. K. Roy presided and His Excellency Dr. K. N. Katju, the Governor of West Bengal, was the chief guest of honour.

Association of Scientific Workers in India

Addressing the scientific workers of the Institute of Science, Bangalore, Prof. P. M. S. Blackett, F.R.S. (who is now in India to advise the Ministry of Defence in the building up of a sound scientific organisation) stressed the importance and the need for an Association of Scientific Workers in India for the purpose of safeguarding and promoting their interests. Referring to the work and activities of the Association of Scientific Workers in England, he said that its objectives were, firstly, to organise as a trade union and secondly, to educate the Government and the people in the knowledge and philosophy of science. He spoke on the advantages of trade unionism for scientific workers as much for the recognition of their rights as also for the abler performance of their noble obligations to mankind. He expressed the hope that the members in the audience would join the association in large numbers and thereby help the cause both of humanity and science.

The Aeronautical Society of India

A meeting was held in the Air Transport Licencing Board Hall, on the 31st July 1948, at 10 a.m., under the chairmanship of Mr. N. C. Ghosh, Director-General of Civil Aviation in India. A distinguished gathering of scientists, engineers and prominent airline officials was present.

The members present constituted themselves into a Society named the Aeronautical Society of India with the main object of promoting the advancement and diffusion of knowledge of the aeronautical sciences and aircraft engineering and the elevation of the aeronautical profession.

Mr. N. C. Ghosh was unanimously elected the President of the Society, with Dr. V. M. Ghatage as Vice-President, Mr. S. C. Sen as Honorary Treasurer, and Dr. P. Nilakantan as Honorary Secretary.

National Institute of Sciences of India

The following awards of Research Fellowships have been made by the Council of the National Institute of Sciences of India:—

National Institute of Sciences Senior Research Fellowship. 1. Dr. J. Bhimasenachar (Physics), Andhra University, Waltair. 2. Mr. S. Chatterjee (Physics), Bose Institute, Calcutta. 3. Dr. B. D. Tilak (Chemistry), Bombay University, Bombay. 4. Dr. L. S. Ramaswami (Zoology), Mysore University.

National Institute of Sciences Junior Research Fellowship. 1. Mr. U. Burman (Methematics), Calcutta University. 2. Mr. B. K. Banerjea (Physics), Calcutta University. 3. Mr. K. Das Gupta (Physics), Calcutta University. 4. Mr. P. C. Mukherjee (Chemistry), Calcutta University. 5. Mr. S. Veda Raman (Chemistry), Indian Institute of Science, Bangalore. 6. Mr. Y. Sunder Rao (Botany), Government College, Hoshiarpur. 7. Mr. S. D. Misra (Zoology), Lucknow University.

Imperial Chemical Industries (India) Research Fellowship. 1. Dr. R. G. Chatterjee (Chemistry), Calcutta University. 2. Mr. K. Venkateswarlu (Physics), Andhra University, Waltair. 3. Mr. T. V. Deshikachary (Botany), Madras University. 4. Mr. J. Mitra (Botany), Calcutta University. 5. Mr. T. V. R. Pillay (Zoology), Zoological Survey of India. 6. Dr. C. V. Subramanian (Botany), Madras University.

Draft Indian Standard for Shrinkage Test

The Indian Standards Institution announces the compilation of its first draft standard in the domain of textiles. It is entitled "Draft Indian Standard for Method of Test for Shrinkage of Woven Cotton Cloth in Laundering", and has been prepared by an expert Sectional Committee of the Textile Division Council of the Institution.

The object of the test specified in this draft is to provide an agreed method of estimating shrinkage on laundering of woven cotton cloth, in order that the manufacturers may be able to make due allowances in every type of fabric produced by them.

The draft, based on the corresponding specification issued by the American Society for Testing Materials, describes the scope of the Test, the apparatus to be used, preparation of test samples and method of conducting the Test for shrinkage after laundering.

This draft on Shrinkage test of cloth after laundering has been widely circularized to industrialists and technologists in the Textile field. Comments will be received till the 23rd of November 1948, by the Director, Indian Standards Institution, 'P' Block, Raisina Road, New Delhi.

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